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TRADE

TRADE is cosmopolitan. No activity in which man engages breaks down his inherent provincialism so fast, widens his horizon so far, frees him so fully from the fetters of immobility. No barrier, be it sea or swamp or desert or mountain range, can hold him back in his restless search for old things that he wants, new things that he needs.

As Necessity is the mother of invention, so she is of trade. Because England needs sulphur and citrus fruits and Italy needs coal, the trade between Newcastle and Naples is born; because Belgium needs bread, and Canada, cloth, the wheat fields of Manitoba trade with the looms of Liege; because Germany needs meat and Argentina manufactured wares, a brisk intercourse goes on between them year in, year out; and because Americans will have their breakfast cup of Santos coffee, and Brazilians must buy machinery, the trade between New York and Rio de Janeiro flourishes.

The shuttles of trade ply incessantly. The web of trade weaves in and out among the islands of the world, from continent to continent, across the plains and through the mountain passes. The strong warp of great trade routes is laid from land to land, from shore to shore. Swift steamers on the seas and streams, and trains and trucks on land, carry the woof of the world's trade texture; and so finally the fabric of the world's trade holds the nations together.

The nations of the New World will find their greatest good in reciprocal trade and harmonious interdependence, despite differences in race, and language, and social organization. Eventually North American capital and North American enterprise must develop South American resources and build up South American prosperity. The "Western Commonwealth of Nations" will then stand as a unit in promoting the World's peace, an actual concourse of friendly peoples.

ECONOMIC GEOGRAPHY

VOL. II

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No. 2

THE CHARACTER AND DISTRIBUTION OF SOUTH AMERICAN TRADE

Clarence F. Jones

Economic Geographer, Clark University

SOUTH AMERICAN trade engages the attention of European and North American commercial interests in ever increasing measure. The development of the tropics, commercial expansion, and the influx of European immigrants stimulates both general and special interest in the resources and the affairs of the continent.

The development of the tropics throughout their extent as a great potential producing area of food and raw materials has excited the imagination of the temperate peoples who have already begun to feel the pressure of population upon the food supply; and yet this hope of a great tropical granary and storehouse, so far as South America is concerned, seems little more than fancy. The three-fourths of South America that are tropical, supply but one-fourth of the exports and take even a smaller part of the imports, whereas the temperate fourth of the continent furnishes three-fourths of the exports and practically monopolizes the imports. Like the trade, the population of European origin, and, in ever increasing proportion, the immigration of European settlers, are largely confined to temperate South America.

South American trade consists in large part of temperate and subtropical products which go to the north temperate regions and of imports largely from that zone to the areas of the

continent which supply the exports. The United States, the manufacturing regions of northwestern Europe, and Japan look more and more to this southern continent for raw materials to supply their manufacturing plants, and for foodstuffs to feed their increasing industrial population. In turn all the South American countries are in that stage of economic development where the energies of the people are devoted chiefly to the production of raw materials rather than of manufactured goods—materials for the most part of bulky commodities of comparatively low value for their bulk, products of the farms, the ranges, the forests and the mines.

THE EXPORT TRADE

Each important region of the continent specializes in some one product or a group of related products for export. The red rolling tropical hills of the Plateau of São Paulo yield 70 per cent of the world's coffee exports (Fig. 1). The monotonous level plains of the Pampas of Argentina and Uruguay produce 20 per cent of the export wheat and wheat flour of the world, 70 per cent of the export flaxseed, and 50 per cent of the export corn. The natural and alfalfa pastures of these fertile plains, the semi-arid grasslands of Rio Negro and Chubut, and the cool, windy, moist plains of southern Patagonia graze the millions of cattle and sheep which supply

Editor's Note: This article introduces a series on the Trade of South America by Dr. Jones, of which the rest will appear in subsequent issues of ECONOMIC GEOGRAPHY.

54 per cent, 25 per cent, 23 per cent, and 30 per cent of the world's exports of beef, mutton, wool, and hides and skins respectively. The fertile agricultural lands tributary to the Atlantic between Cape São Roque and Cape San Diego supply appreciable quantities of foodstuffs for the great manufacturing regions of the world.

The western part of South America has products as distinctive as the south-eastern margin. The drab, parched nitrate Pampas of northern Chile produce nearly all the sodium nitrate of the world (Fig. 2). The Chuquicamata and Braden copper mines of Chile, the Coro Coro and Coborizos districts of Bolivia, and the Cerro de Pasco, the Morococha, and the Casapalca regions of highland Peru yield approximately 20 per cent of the world's copper¹ (Fig. 3). Bolivia produces 23 per cent of the world's tin and the Minasragra mines of Peru yield 72.8 per cent of the vanadium of the world. The petroleum districts of northern Peru and those of Venezuela are becoming considerable sources of this essential product. The western part of the continent in contrast to the eastern margin ships raw and partially manufactured industrial materials.

THE IMPORTANT EXPORT COMMODITIES

A few products make up the major part of the export trade of South America as is typical of most regions where the exploitation of natural resources is the chief kind of activity or where relatively new agricultural lands with a sparse population are being developed. Approximately 80 per cent of the value of South American exports in 1921-23 (three year average)² was contributed by

ten kinds of commodities in order of value as follows: coffee, wheat and wheat flour, meats, corn, nitrate, flaxseed, metals (copper, tin, silver, gold, platinum and their ores), wool, hides and skins, and sugar (Fig. 4).

Of these articles only two, coffee and sugar cane (about one-fifth—18.8 per cent—of the total exports of South America), are tropical products in the sense that they are produced in a large measure only in the tropics. While coffee has been classified as a tropical product, it should be noted that most of the coffee of the continent grows on plateau or mountain lands relatively near the margin of the tropics where a distinct mild-to-cool season alleviates the enervating heat and humidity of the tropics. Therefore, while three-fourths of the continent is tropical, about three-fourths of the exports of South America consist of temperate articles.

THE TRADE OF TROPICAL AND TEMPERATE PARTS

It is significant that 73 per cent of the exports of South America consist of products from the farms and the ranges and that about two-thirds of the total comes from the southeastern part of the continent between 20 and 54 degrees south latitude (Fig. 5).

The consumption of tropical foodstuffs in the temperate zones of the world is small compared to the use of products produced in those zones. The great importing areas for foodstuffs lie in the north temperate regions and while it is true that these areas consume large amounts of tropical foods, the main diet of the people consists of the bread, meats, vegetables and dairy products of the temperate zone and the diet is not likely to be changed materially by the importation of tropical foodstuffs, no matter how

¹ Weed, Walter H, "Copper" in *The Mineral Industries during 1924*, Vol. 33, p. 180.

² Statements concerning values, rank, etc., refer to the three-year average, 1921-23, in most cases. Statistical data have been drawn from various sources, chiefly from official statements of trade by the Pan American Union, Washington, by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, from the *Statesmen's Yearbook*, from *El Comercio Exterior Argentino*, Nos. 190, 191, 193,

194, and from *Comercio Exterior Anuario Estadística de la República de Chile*, Vol. XI, 1920, 1921, 1922 and 1923. Conversion of values to United States money has been made on the basis of equivalents used by the United States Treasury.



FIGURE 1.—Fazenda Guatapara, São Paulo, Brazil. Coffee is the most important export of South America in value, making up 16 per cent of the total exports. Without this product, which comes from plateau or mountain lands largely near the margin of the tropics, more than 90 per cent of the remaining exports of South America consist of commodities produced in the temperate part of the continent. (Courtesy of William H. Ukers, and the Tea and Coffee Trade Journal.)

favorable the conditions in the tropical part of the world may be for the production of enormous quantities of these articles. The rôle of the tropics in supplying the staple foods of the future will be at most a secondary one. While the amounts of accessory agricultural commodities from the tropics will increase greatly, the production of breadstuffs, meat, dairy products and vegetables will continue to be mainly the affair of the lands now supplying them.

Small patches of tropical South America can produce, insofar as the physical environment is concerned, the special tropical foods demanded in the temperate zones. Yet this part of the continent has not been called upon to furnish special commodities in large amounts. Central America and various West Indies Islands, areas nearer to the markets of the United States and northwest Europe and having better transportation facilities, more favorable economic conditions and a good labor supply, yield quantities of sugar,

bananas, cacao beans, and other tropical products to meet the requirements of the temperate markets. This situation in all probability will remain as it is until the demand for these tropical articles far exceeds that of the present.

THE DOMINANCE OF THE TEMPERATE PART

A number of factors operate to augment the importance of the trade of the temperate part of South America and to decrease that of the tropical part.

Fertile Agricultural Lands

In the first place the temperate part has the largest continuous fertile agricultural area of the world producing primarily for export foodstuffs and beverages, hides and skins, and wool.

On the intermediate slopes of the rolling hills of the plateau of São Paulo one finds ideal conditions for the extensive cultivation of coffee. They include large areas of residual soil of high iron and potash content, the rolling plateau



FIGURE 2.—Dumping nitrate into the railways cars, Oficina Aconcagua, Chile. Northern Chile produces nearly all the sodium nitrate of the world. Nitrate amounts in value to about 60 per cent of the exports of Chile. It ranks fifth in the export commodities of South America, representing 6.3 per cent of the total.

surface which insures free drainage of both air and water, and especially a favorable climate—45 to 60 inches of

precipitation per year, a marked summer maximum, a relatively dry autumn and winter which permit proper harvesting



FIGURE 3.—The Oroya plant of the Cerro de Pasco Copper Corporation treats the ore from the Cerro de Pasco, the Morococha, and the Casapalca Mines and produces in value copper which equals about one-fifth of the exports of Peru and one-third of the exports of copper from South America.



FIGURE 4.—The leading items in the export trade of South America emphasize the importance of the temperate agricultural lands and the mountain mining regions and the small part taken by tropical South America which comprises approximately three-fourths of the continent. In 1911 the leading ten exports included, in order of value, coffee, nitrate, rubber, wheat and wheat flour, wool, hides and skins, meats, metals, linseed and cacao. The tropical products now make up an even smaller part of the exports.

and drying of the crops, and high summer temperatures. These and other advantages enable Brazil to produce more than 70 per cent of the world's crop.

On the Pampas of Argentina and Uruguay factors favor the extensive cultivation of wheat, corn and flax. The level plains permit the use of a large amount of machinery, the soil is fertile and especially friable since it is free from stones and stumps (Fig. 6). The land is cheap, permitting an extensive type of agriculture which gives a low yield per acre but a large production per capita. The region has from 15 inches of annual precipitation on the west margin of the wheat belt to 45 inches on the eastern part of the corn region. The maximum precipitation comes during the summer, followed by a dry harvest period. While these conditions in general favor the production of corn,

wheat and flax, the region is not without its climatic handicaps. In the central section the maximum precipitation, unfortunately for corn, comes in the late rather than in the early summer. The whole region is subject to severe and continued droughts and to unusually wet seasons.

In South Brazil, Uruguay, and Central Argentina the animal industries are of large importance, owing to the vast areas of cheap pasture lands, large land holdings, the sparse population, the fair distribution of rainfall giving good pasturage, the long growing season and the mild winters which permit open grazing and feeding of stock throughout the year thus materially decreasing the cost of production, and the extensive use of oats as a winter forage and alfalfa pastures as fattening ranges (Fig. 7). With these advantages Argentina and

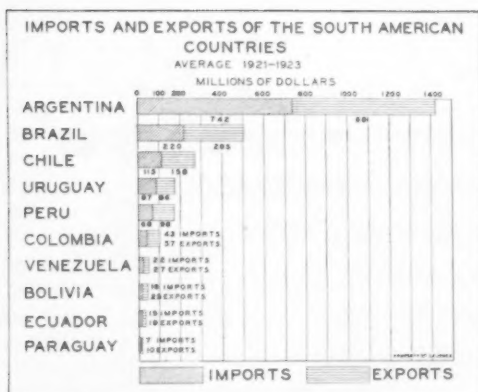


FIGURE 5.—The position of Argentina, Brazil and Uruguay in the export and import trade of South America is due to the great advantages which the southeastern part of the continent has in its friable fertile soil, rolling plateaus and level plains, the humid subtropical and mild humid temperate climates, accessibility to the sea, excellent transportation facilities, progressive population of European extraction, favoring the production of the products of the fertile farms and the extensive ranges.

wool and mutton in the export trade of this section of the continent.

The Character and Distribution of the Population

In the second place, the southeastern part of the continent holds 70 per cent of the total population and about 90 per cent of the people in which the European element predominates, while the population of the tropical portion consists mainly of Indians, negroes and mestizos—a population with a small producing capacity and a smaller purchasing power. Certain dreaded diseases prevalent in tropical lowlands sap the vitality and even the lives of the people dwelling there. Among these are malaria, yellow fever, tropical dysentery, and the hook-worm disease. The people dwelling in the hot, moist parts of South America are subject to these diseases, except



FIGURE 6.—Rolling prairie land in the province of Entre Rios, Argentina. The fertile and friable brown silt loam soils of the Pampas of Argentina constitute one of the chief factors in making this area a large surplus food and raw materials region of the world.

Uruguay are able to market enormous quantities of high grade beef in north-western Europe in competition with grain fed beef from other parts of the world (Fig. 8).

To the south of the Pampas the semi-arid plains of northern Patagonia and the cool moist stretches of southern Patagonia furnish their quota of the

that in certain areas the negroes enjoy almost complete immunity from yellow fever. Where these diseases prevail, economic progress is stagnant, the victims being pale, weak and unambitious, and usually content with a bare living. As laborers they are very inefficient.

In addition, the large majority of the people living in the truly tropical part



FIGURE 7.—Alfalfa field, Coqueta Estancia, Entre Rios, Argentina. In this region conditions are so favorable for the growth of alfalfa that one planting commonly furnishes excellent fattening ranges for stock for seven to eight seasons. The mild open winters permit grazing throughout the year.

of South America produce little more than they consume. And why should they? In the hot climate little clothing is needed; a crude, easily constructed hut furnishes shelter, a few banana trees and a patch of corn, beans, and manioc supply food. Employers of native labor maintain that more work cannot be secured by higher wages, for the native laborer on receiving more money will work fewer days per week. In the opinion of the native, ease is the greatest of luxuries; he does not sacrifice this readily to obtain something less desirable.

While all of the tropical countries of South America include highland areas upon which people of European stock may live in health and retain some of the vigor characteristic of dwellers in cooler climes, these areas have not benefited by large numbers of immigrants. Here the advantages of cooler temperatures are largely offset by the Indian peons, the half-breeds, and negro laborers, who create a marked social class and cause the European emigrants to avoid



FIGURE 8.—Fat cattle from alfalfa-pasture in the slaughtering pens of the Compania Swift de La Plata, Rosario, Argentina. Young cattle finished off on fine alfalfa pastures in Argentina make excellent chilled beef which goes into the best English markets in competition with grain-fed beef from other countries. The acreage of alfalfa in response to the demands for high grades of beef is increasing in various parts of the Pampas. It is not uncommon on an Estancia of 20,000 hectares to have 10,000 to 12,000 hectares of fine alfalfa range.



FIGURE 9.—Santos, Brazil. Excellent and efficient facilities have been developed at the world's largest coffee exporting port to transfer to ocean vessels the great flow of this commodity from the plateau of São Paulo. These facilities are important in building up the east coast trade. (Courtesy of Pan American Union.)

these lands and to go to the uplands of South Brazil, Uruguay, Argentina and Chile. This contrast will be more and more marked with increasing immigration. Thus the lack of an adequate and efficient labor supply for a large agricultural development of tropical South America diminishes the position of this part of the continent in the export trade.

Transportation Facilities

In the third place, transportation facilities play an influential part in this trade. The trade of South Brazil, Uruguay and Argentina is handled by a few large ports which have modern and efficient facilities and to which ample shipping comes to care for the flow of bulky commodities through these channels (Fig. 9). Also these ports are tied to the hinterland by a network of railway lines which connect the large fertile agricultural areas with cheap water transportation. South Brazil, Uruguay and Argentina possess 78 per cent of the railway mileage of the continent. Furthermore, no part of the fertile area of the Pampas lies more than 300 miles from cheap water transportation.

In contrast to these conditions the tropical part of the continent is inade-

quately served by transportation facilities. The smaller ports, the less modern ports than those of the southeastern part of the continent, are not so well served by shipping and are poorly connected with the interior with efficient transportation. The tropical part of the continent has only 4 per cent of the railway mileage. These railways consist for the most part of short lines from port to inland highland city or of short connecting links in a river system. Thus no part of tropical South America possesses anything like a railway system. Colombia has the nearest approach to a system in the Magdalena River and the rail connecting links. Yet the coffee which comes out from the Bogotá plateau and the merchandise which filters in moves under difficulties. Going inland merchandise for Bogotá is unloaded on the wharf at Puerto, Colombia, carried by rail to Barranquilla, and there transferred to river steamers which transport it up the lower Magdalena to La Dorada. From there it is carried by rail around the rapids of the middle Magdalena (Fig. 10) to Beltrán where it is delivered to the steamer which takes it up the upper Magdalena to Girardot, a point connected with Bogotá by rail.



FIGURE 10.—A river scene on the Middle Magdalena showing bags of coffee ready for export, and illustrating the primitive and poor transportation facilities of this part of South America in contrast to the excellent equipment for handling coffee from the São Paulo plateau. (Courtesy of Pan American Union.)

THE EXPORT TRADE OF THE WEST COAST

While the eastern and northern parts of South America specialize in the exportation of foodstuffs, beverages, hides and skins, and wool—products of the farms and ranges—the western part exports chiefly raw and partially manufactured industrial materials—products for the most part of the mines. Almost 70 per cent of the exports of western South America consist of products of the mineral industries. Furthermore, the west coast export trade (\$301,576,061—average 1921–23) is only one-third as important in value as the east coast trade (\$1,063,247,536) (Fig. 5). A number of factors contribute to this trade relationship.

Up to the time of the opening of the Panama Canal the west coast was isolated from the world markets, owing to the long and dangerous voyage along the southern part of Chile and through the Strait of Magellan or around the horn.

With the opening of the canal the west coast entered a trade era of considerable importance.

The Cordillera of South America, the longest and most continuously high mountain barrier in the world, lies near the Pacific and cuts down the area tributary to the west coast to less than one-fifth of the continent. In this area no large navigable rivers offer routes into the interior and other means of entering the mountain zone are not easily provided. Between latitudes 5 degrees and 35 degrees S. no pass in the Andes lies at an elevation of less than 11,000 feet. The trade handicap because of this situation is enormous; the Central Railway of Peru is forced to attain an altitude of 15,680 feet in a distance of 106 miles from the coast (Fig. 11); the Southern Railway of Peru crosses the divide at 14,688 feet, the Arica-La Paz Railway at 13,986 feet and the Antofagasta-Bolivia Railway at 12,500 feet.

In this area the railroad mileage is consequently small; the west coast



FIGURE 11.—Ticlio, Peru, the highest railway station in the world—15,610 feet above sea level. The Central Railway of Peru attains an altitude of 15,680 feet within 106 miles of the sea. It passes through 65 tunnels and has 67 bridges and 16 switchbacks in this distance. For miles the track clings to a narrow shelf of rock, cut into the precipitous wall high above the valley floor. The construction of this railway is considered one of the greatest of all engineering feats. Such are the difficulties of piercing the highland districts of western South America.



FIGURE 12.—A portion of the harbor, Valparaiso, the only port on the west coast of South America where large ocean vessels take on or discharge freight directly at the dock. The Chilean Government has spent huge sums of money in extending into deep water from two points the great breakwaters which afford protection to ships in the harbor. After descending the ladder and jumping from it to the bobbing launch at all west coast ports as one comes south, it is a real relief to step from the gangplank to the dock at Valparaiso.

republics—Ecuador, Peru, Bolivia³ and Chile—have 17 per cent of the railway mileage of the continent, about half of this in Chile lies parallel to, instead of

³ Bolivia is listed here because the highland part of that country is tributary to the Pacific and it produces about 95 per cent of the exports of the republic.

transverse to, the coast and consequently is not important commercially. Most of the remaining mileage consists of short independent lines which tap fertile agricultural valleys in the Peruvian Coastal Desert or the chief mining centers in the Andean Highland or the nitrate Pampas.



FIGURE 13.—Ocean ships lying one-half mile off shore at Mollendo, Peru, the terminus of the Southern Railway of Peru and the leading port of southern Peru. The open roadstead nature of most of the harbors and the large ocean swell on the west coast of South America make anchorage off shore the only safe procedure in the absence of artificial breakwaters.

In contrast to the six well developed ocean ports of the east coast, the west coast is served by three times the number of important ports, each of which serves a definite small region and a specialized trade. Only one west coast port (Valparaiso) has a real dock system for handling cargo (Fig. 12), although Callao will have docks in a few years if present plans materialize. Most cargoes on the west coast are lightered. The open roadstead nature of most of the harbors makes anchorage off shore the

only safe procedure in the absence of artificial breakwaters (Fig. 13). The small value of commerce handled at most ports does not justify a large investment in costly port improvements. Also a large value of exports may be handled, where minerals make up the chief exports, without much bulk being involved and for this reason lightering is not so inconvenient as would be the case in handling considerable quantities of grain and coffee. Nevertheless these conditions constitute a significant handicap to the development of trade with the west coast.

The population served by the west coast trade is about one-fourth of the total of the continent and, except in Chile, most of the people dwell in the Andean Mountains and Plateaus, which are reached only with difficulty. In this portion of the continent the white population forms a very small part of the total, while most of the population, except in central Chile, consists of the less progressive Indian or mestizo who do not represent large producing capacity.

A large part of the area tributary to the west coast is desert waste (Fig. 14), tropical or temperate forest, rugged mountain heights, or bleak plateau land (Fig. 15), but in this lies the secret to



FIGURE 14.—The West Coast Desert with its bold, bare and uninviting headlands stretches from 5° S. to 30° S. latitude, a distance of 2,000 miles and extends inland to the great western range of the Andes. In this region only in the irrigated coastal valleys of Peru or the copper camps and nitrate Pampas of Chile are commodities produced for export. Desert huts near Pueblo Hundido, Chile.



FIGURE 15.—A llama train driver with his family and his sacks of tin concentrates camped for the night on the central part of the bleak plateau of Bolivia. Much of the area tributary to the west coast consists of plateau land capable at best of producing only a meager living for the Indians who dwell there. Most of the food and all other supplies for the mines which produce more than 90 per cent of the exports of Bolivia have to be imported.

the trade of the west coast countries. The rich mines of Peru, Bolivia, and Chile yield the products which move to the world marts from this section of the globe. These mines have dominated the whole history and development of these countries. They will in a large measure point out the lines of progress for this area for another half century

and probably more. Yet west coast trade apparently can never become equal to the east coast trade owing to the facts that first, the minerals, while their production may increase notably, cannot equal the agricultural articles of the eastern part of the continent; second, the west coast on the whole is not favorable for a large agricultural development; third, the large area of fertile lands in the east can absorb hundreds of thousands of immigrants now flocking to the shores of the continent and thereby increase enormously its agricultural products for home consumption and also for export.

THE EXPORTATION OF MANUFACTURED ARTICLES

In contrast to all the preceding items manufactured wares make up only about five per cent of the total exports of the continent. In fact, manufacturing enterprises have been restricted mainly to those basic ones which almost every community must have. Conditions contributing to this situation are the sparse population, the character of much of the population, the lack of fuel for manufacturing, the lack of capital for invest-



FIGURE 16.—A family of Bolivian Indians enroute to La Paz with two packs of green barley from their small barley patch. The altiplano of Bolivia is too cool for all the cereals except barley and it ripens only fairly well.



FIGURE 17.—A population group in the coastal desert of northern Peru, showing quite strikingly the negro and Indian elements in the population.

ment in industries, and the large opportunities afforded in other lines.

South America has a smaller population than any of the other continents (except Australia), both in actual numbers (65,775,000) and in density per square mile (about 8). With about $8\frac{1}{2}$ per cent of the land area of the world it has only $3\frac{1}{2}$ per cent of the world's population. Thus it is, as a whole, sparsely populated. Most of the people of the continent live near its borders. Vast tropical, desert and mountain areas—about 45 per cent of the continent—have a population density of less than one person per square mile.

The character of the population has retarded the development of extensive manufacturing industries. The population consists of three definite classes: (1) the white population, (2) the native Indian and imported negro population, and (3) the mestizo population. The white population, mainly Latin European with small numbers of Germans, English and others, forms about one-fourth of the total; it is the most capable

and most progressive element and is found largely in the urban centers, in the highly developed agricultural areas, and in the more progressive mining districts. The Indians and the negroes make up another fourth of the total; most of the former dwell in the hot tropical forest regions or in the bleak Andean mountains and plateaus (Fig. 16) while the latter occupy the northeastern part of Brazil. The remaining half is of mixed blood with the Indian and the negro element predominating in the majority of the group (Fig. 17). Therefore, three-fourths of the population (the Indian, the negro and the mestizo) is of a low order and low producing capacity, undesirable for manufacturing labor.

South America, as a whole, is deficient in the mineral fuels and most of the countries have to depend upon imports for their supplies of coal. Moreover the coals are mainly of poor quality; most of them are semi-bituminous or lignite and in some cases are high in ash and sulphur. The coal resources of South America have been inadequately developed, mainly because of their inferiority in comparison with foreign coals and the inaccessibility of the deposits in all cases except those of Chile. The petroleum and natural gas resources of South America are as yet imperfectly known. These conditions do not favor the development of manufacturing industries.

Water power for manufacturing is little developed in South America. While the continent has in her streams 12 per cent of the potential water power of the world, she has only about one-fifth of one per cent of the developed water power.

The lack of capital has been significant in retarding not only manufacturing industries in South American republics but all other lines of industry. The countries have depended in a large way upon foreign capital for the development of their natural resources, the building of docks and railways, the exploitation of the mines, and even the financing of



FIGURE 18.—Potrerillos, Chile. A twenty-seven mule team straining every muscle to move this generator a few inches up the mountain side. The difficulties of transporting machinery from the seacoast to the remote mining centers of the Andean highlands are great. Yet if the chief exports of these regions are to come forth the machinery must move into the isolated recesses. Mules imported from Argentina and Chile when put to this heavy work live only a short time owing to the fact that they do not get adjusted to the rare atmosphere of the highlands. (Courtesy of Andes Copper Co.)

their governments. Under such conditions it is impossible for manufactured articles to occupy even a secondary place in the exports of the continent.

THE IMPORT TRADE

In contrast to the exports, South American imports consist mainly of manufactured wares of many kinds. Since manufacturing is little developed in most parts of South America and since the various regions of the continent specialize in the exportation of food-stuffs, beverages, and raw and partially prepared industrial materials, it follows naturally that the imports, in a large measure, represent manufactured products. Also the variety of geographic and economic conditions in different parts of South America brings forth a demand for many items.

South America imports everything manufactured, from the almost invisible hair nets on the one hand to the massive, bulky ore crushing machines on the other

(Fig. 18). However, five groups of commodities make up 58 per cent of the total

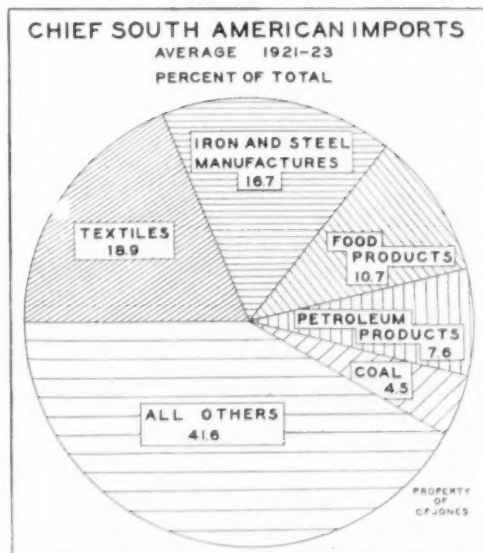


FIGURE 19.—In contrast to the exports of South America the imports consist of manufactured articles, while a few major classes make up the bulk of the imports, they include a great variety of manufactured wares in various forms.

imports. These include textiles, iron and steel and manufactures of, food products, petroleum products, and coal and coke (Fig. 19). The leading two constitute 35 per cent of the imports. Of course these groups include a great many articles.

TEXTILES

In the textile line cotton goods lead. They constitute one-half of the imports of textiles or about 10 per cent of the total. Wool comes next with about one-sixth of the textile imports. For most of the continent, cotton goods are more suitable to the climatic conditions than woolen fabrics. In addition, cotton being cheaper than linen and silk, furnishes the only textile which meets requirements and which lies within the purchasing power of half the people.

While the imports of cotton goods may increase considerably, it is certain, with the growing importance of textile manufacturing in South America, that cotton can not long maintain its relative position in the imports of the continent. The cotton industry of various republics, stimulated by the advantages of nearness to raw materials, by an expanding market, and by the impetus given the industry during the war and the years following in the wake of that catastrophe is growing rapidly.

Peruvian textile mills are increasing their output in several lines. Fairly good qualities of khakis, drills, and percales made in these mills enter the market in retail establishments at prices from fifteen to twenty per cent lower than imported articles. Denims from local mills are supplanting the article from the United States.

Brazil with a population of thirty millions living under tropical or sub-tropical conditions constitutes the largest single cotton goods consuming area in South America. The country now supplies about ninety per cent of her domestic requirements in cotton goods and her exports of cotton manufactures amount to considerable figures. The

number of spindles in Brazil increased from 450,000 in 1900 to 1,250,000 in 1914, and 1,700,000 in 1924. Her exports of cotton manufactures increased from 113 tons in 1918 to 779 tons in 1922.

Colombia is a large importer of textiles and our largest consumer in South America. How long this will continue is difficult to predict since the country now supplies about 60 per cent of its total consumption.

Argentina takes 68 per cent of the total South American textile imports. Her rather large population with a relatively high buying power, her lack of textile manufacturing industries, and her large export trade are factors stimulating the textile trade. She handles three-fourths of all the imports of cotton manufactures and 70 per cent of the woolen imports. Argentina is a non-tropical country, yet her receipts of cotton goods equal half of her imports of textiles.

IRON AND STEEL

The items in this group include a greater variety of articles than those of the textiles and represent a value almost equivalent to the leading group. They occupy a leading position in the import trade of these republics owing in the first place to the lack of the essential basic materials for large iron and steel industries in most areas of the continent, and in the second place the lack of a sufficient labor supply, available capital, stable government, or favorable climatic conditions in the areas where the raw materials do exist.

While iron and steel goods have a fairly wide distribution over the continent, 72 per cent of the imports go to South Brazil, Uruguay and Argentina, representative of the great production in those countries of commodities for export. Argentina alone takes more than one-half the total. Her imports consist chiefly of steel rails, locomotives, railway supplies, and agricultural machinery, for without the latter her large crops of wheat, corn and flaxseed would go unharvested and without the former to



FIGURE 20.—The Guggenheim tin mill at Pongo, Bolivia. All the timber, structural steel and machinery for this large mill were transported a distance of sixty miles by mule teams and trucks, from Eucalyptus on the Antofagasta-Bolivia Railway across the eastern side of the plateau of Bolivia and over the Eastern Range of the Andes at an elevation of 16,000 feet. In turn the tin concentrates are taken to the railway at Eucalyptus in wagons drawn by mules or on the backs of llamas which carry one Spanish quintal each (101.43 pounds). See Fig. 15. (Courtesy of F. V. Aramayo.)

move them to the seaboard they would remain unmarketed. The west coast countries which take 25 per cent of the imports of iron and steel goods demand especially mining machinery, railway supplies, and structural steel for large smelting and ore concentration plants (Fig. 20). Thus the countries which produce the raw industrial materials and foodstuffs for the manufacturing regions of the north temperate zone can attract to their shores the bulk of the trade in iron and steel goods as well as manufactured food articles and petroleum and coal.

FOOD PRODUCTS

As with the other imports, the receipts of food products include many articles, yet wheat and wheat flour constitute almost one-third of the total. Brazil takes 77 per cent of the imports of wheat and wheat flour, while Peru, Bolivia and the north coast countries take the remainder.

Two facts are striking in connection with the imports of articles of food: (1) Argentina, the largest exporter of foodstuffs, consumes one-half according



FIGURE 21.—One-half the fleet of twelve ocean tramp steamers anchored in the Parana river at Rosario on April 23, 1925 waiting for a berth at which to load grain being shipped to the markets of northwestern Europe. A return cargo from Europe for many of these vessels consists of Welsh or Newcastle coal.



FIGURE 22.—Santiago del Estero Province, Argentina. In the more remote parts of Argentina, especially in the scrub forest region of the Northwest, the railways burn wood owing to the scarcity of coal, and to the high price of imported coal. Little of this wood fuel reaches the central part of the Pampas owing to the long haul.

to value of the imports of this class, and (2) the intra-continental trade in food products is larger than in any other general class of goods. The importance of Argentina in this trade accrues from her large consumption of yerba mate, sugar, coffee, and a long list of items in smaller amounts. The position of the intra-continental trade in this class of goods results from differences in climatic conditions between the various regions. This trade is represented by shipments of wheat and flour from Argentina to Brazil and Paraguay, yerba mate, coffee, tropical fruits from Brazil and Paraguay to Argentina and Uruguay, sugar, cattle, and fruits from Peru to Chile and Bolivia, and wheat and flour from Chile to Peru and Bolivia. This trade certainly will increase with the development of the several republics.

PETROLEUM PRODUCTS AND COAL

While these items in value rank with the imports of food products, they are far more important in a commercial way. In tonnage coal ranks above any other import, more than 6,000,000 tons annually being taken for transportation purposes and manufacturing plants by Argentina, Brazil, Uruguay and Chile, countries which collectively account for

95 per cent of the imports of this commodity.

These countries have the great export tonnage of nitrate, wheat, corn, linseed and coffee. Therefore coal constitutes largely the incoming cargo of tramp vessels which take away these bulky commodities (Fig. 21). The ability to get coal as cargo at or near the consuming regions of these items is one of the most significant aspects of South American trade. Without it the railways which place these articles at the seaboard could not operate effectively (Fig. 22) and without it many ships would not make the long trip to Argentina or Chile.

The four countries which dominate in the import coal trade take almost 98

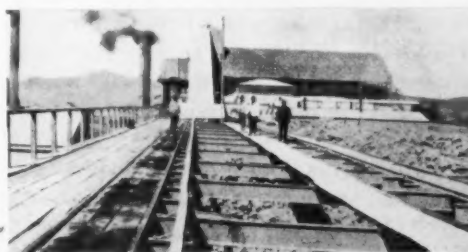


FIGURE 23.—Oficina Aconcagua in the province of Antofagasta, Chile. Fuel Petroleum is now replacing coal as a fuel in the plants of the Nitrate Pampas; this region takes a large part of the imports of petroleum on the west coast of South America.

per cent of the imports of petroleum products. Fuel oil is necessary in Argentina, Brazil and Uruguay for the navies, ocean shipping, and some railways, and in the nitrate plants of northern Chile (Fig. 23) while kerosene has reached the more remote parts of the continent. With the growing importance of the automobile trade in South America, gasoline assumes a significant place in the trade of petroleum products.

The South American regions which specialize in the production of food-

lics. The two leading countries in the trade, the United States and Great Britain, have one-half the trade of the continent. The latter receives 21 per cent of the exports and furnishes 24 per cent of the imports, while the former takes 26 per cent of the exports and supplies 27 per cent of the imports into South American countries. The third country, Germany, who lost much of her trade to the United States during the war, is staging a remarkable come-back in certain sections of South

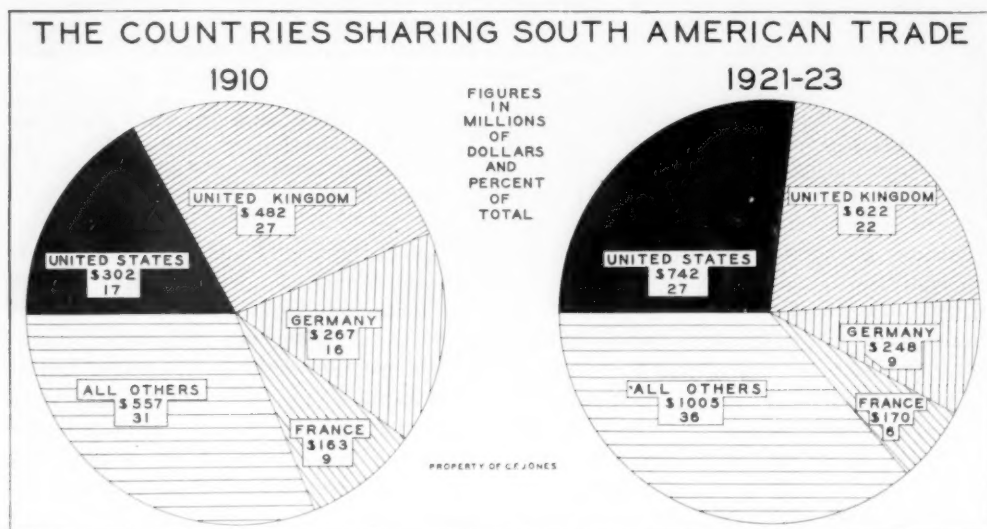


FIGURE 24.—The position of the countries sharing South American trade changed in a remarkable way between 1910 and 1923. The United States, the second country in 1910 with 17 per cent of the total trade now leads with 27 per cent of the total. The large share taken by "all other countries" in 1921-23 indicates a broadening trade relationship for the South American Republics; it means also keener competition in the markets of the southern continent.

stuffs or raw industrial materials for export have sufficient funds with which to purchase the varied manufactured articles of the north temperate zone. Since these same areas lack the power, the basic industrial minerals and the capital for a large development of manufacturing, this trade relationship will continue for some time.

COUNTRIES SHARING SOUTH AMERICAN TRADE

Four countries dominate the trade of South America, accounting for about 64 per cent of the total trade of the republics.

America. Her shipping in the ports of Rio de Janeiro and Buenos Aires is back almost to pre-war tonnage.

A notable change has taken place in the distribution of South American trade since 1910. In that year four countries handled 70 per cent of the trade; now six countries share in that percentage. In 1910 the United Kingdom led in the trade with 27.2 per cent of the total, the United States came second with 17 per cent and Germany a close third with 16 per cent (Fig. 24). The significant redistribution of South American trade developed through the influence of (1) the



FIGURE 25.—The United States imports large amounts of copper bars from western South America, especially from northern Chile owing to the uniform quality and high grade copper which is produced by the simple leaching process from the oxide ores of the large Chuquicamata mills. This copper is used especially for wire and electrical purposes. (Courtesy of Chile Copper Co.)

changes ushered in by the World War and prolonged by the aftermath, (2) our increased consumption of foodstuffs and raw materials, (3) our greater activity in the world marts demanding manufactured articles, and (4) a greater trade activity on the part of other European countries.

THE SMALL INTRA-CONTINENTAL TRADE

A striking and significant fact about the distribution of South American trade is that about 90 per cent of the foreign commerce of the ten republics is with countries outside of the continent. The countries for the most part are dominated by agriculture or mining. They are producing raw materials and foodstuffs for the manufacturing regions of Europe and the United States and for that reason they buy, to a large extent, from those areas.

The trade carried on between the South American republics results largely from climatic differences. It consists

for the most part of the exchange of products of the tropical sections for commodities of the temperate regions, as coffee, sugar, yerba mate, cacao and fruits for wheat and wheat flour and meats.

The largest intra-continental trade moves between Argentina and Uruguay on the one hand and Brazil and Paraguay on the other. Owing to its inland position, 81 per cent of the exports of Paraguay go to South American countries (in part for reshipment) and 44 per cent of its imports come from neighbor republics. Peru sends about 20 per cent of its exports to the other west coast countries supplying them with tropical products from its irrigated coastal valleys. Intra-continental trade would be a larger part of the total were it not for the fact that the northern part of the continent, the truly tropical part, exchanges products with the United States rather than with the temperate parts of South America. This trade relationship is likely to be maintained for some time

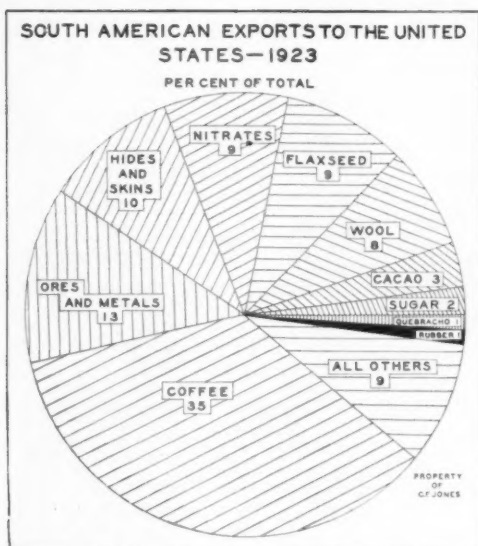


FIGURE 26.—One of the most striking facts concerning South American exports to the United States is that tropical products constitute only about 45 per cent of the total, including coffee most of which grows on plateaus near the margin of the tropics. It is probable that this fact will be more significant in twenty-five to thirty years from now when the United States will have shifted from an exporter of temperate foodstuffs to a large importer.

because tropical regions much nearer the temperate parts of the continent than the north coast can more advantageously

supply those regions with most of the tropical products they need.

TRADE WITH THE UNITED STATES

The attention centered upon the trade of the United States with the South American republics since 1914 has tended to give perhaps the impression that trade prior to that time was negligible. Thirty-five years ago (1890) our exports to South America amounted to 30 million dollars or 4.2 per cent of our total exports, and our imports from South America totalled 112 million dollars or 14.1 per cent of our total imports. In 1921-23 our exports of 256 million dollars to South America equalled only 6.2 per cent of our total exports and the imports from that continent of 374 million dollars made up only 11.9 per cent of our total imports. While our commerce with South America has increased in this period about four and one-half times, the proportion of the present trade to our total trade is no greater now than 35 years ago.

From the standpoint of the total South American trade, however, the case is somewhat different. Our share of South American commerce increased



FIGURE 27.—The Chile Copper Company in the Chuquicamata hill near Calama has the most extensive copper deposits of the world. The ore occurs in a hill two and one-half miles in length and one-third of a mile wide. Much of the hill consists of greatly shattered rock so thoroughly mineralized that the entire mass of rock is considered ore. The known ore reserves averaging 2.12 per cent copper total 700,000,000 tons, being sufficient to last the company three-fourths of a century at the present rate of production.

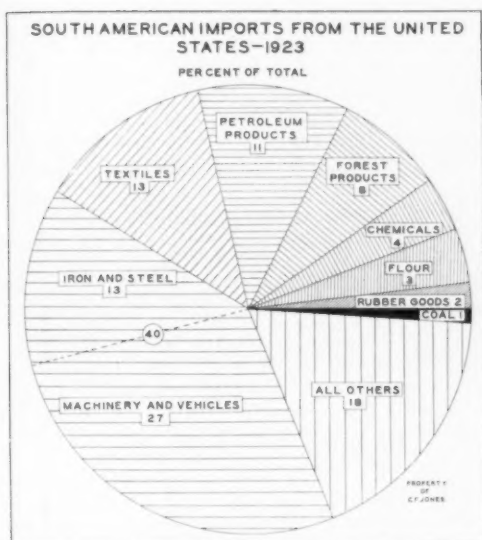


FIGURE 28.—South American imports from the United States consist almost entirely of manufactured articles.

from less than 10 per cent in 1890 to 17 per cent in 1910, and to 26.6 per cent of the total trade of that continent in 1921-23. The United States is the leading country in supplying goods according to values to all the republics of South America, except Paraguay, and leads other countries in taking exports from the west coast, the north coast and Brazil, regions which supply minerals and tropical agricultural and forest products.

Exports to the United States

While South America sends a variety of products to the United States, ten commodities make up 90 per cent of her exports to this country. These are, in order of value, coffee, ores and metals (chiefly copper, Fig. 25), hides and skins, nitrates, flaxseed, wool, cacao, sugar, quebracho, and rubber (Fig. 26). The non-tropical products (ores and metals, hides and skins, nitrates, flaxseed, wool, etc.,) contribute about 55 per cent of the total exports to the United States, while tropical commodities (coffee, cacao, sugar, rubber, etc.,) contribute only about 45 per cent of the total.

This is especially significant because little of the United States is tropical while three-fourths of South America has tropical climates and because most of the coffee, the leading item in the trade comes from the rolling São Paulo plateau at the southern margin of the tropics. Thus differences in climatic conditions between the United States and South America are not so significant in the movement of commodities from that continent to this country as the differences in resources (ores and metals, and nitrates) and differences in stage of development (hides and skins, wool, flaxseed, etc.).

This trade relationship is likely to continue for some time owing to the facts that (1) the west coast countries will be large producers of minerals for export for at least a half century more (Fig. 27), (2) the development of the agricultural lands of the southeast part of the continent, areas now receiving thousands of immigrants, will supply increasing quantities of farm and range products for export and (3) our growing population and expanding manufacturing industries will have need for increasing amounts of these items.

Imports from the United States

In contrast to the exports of South America to the United States, her imports from this country consist of a large variety of commodities, mainly of manufactures because (1) manufacturing is little developed on the continent, (2) the needs of those countries include many wares, and (3) American capital and machinery are entering South America in increasing amounts for the development of the latent resources of the countries.

The leading imports from the United States are iron and steel and manufactures including machinery, textiles, petroleum products, forest products—timber and paper—chemicals, flour, and rubber manufactures (Fig. 28). These items amount to 80 per cent of the total imports from the United States. Gen-



FIGURE 29.—Sacked wheat ready for shipment at a railway station in the Province of Buenos Aires, Argentina. It is significant that this article so necessary for the manufacturing population of the United Kingdom moves from the regions of production in Argentina to the ports over railways largely owned by the British and from the seaboard to the United Kingdom chiefly in British ships. (Courtesy of H. G. Olds.)

eral iron and steel and petroleum products are fairly well distributed; the former are needed in all lines of development and the latter are widely used in different forms—gasoline, kerosene, and fuel oil. Most other wares enter rather few markets; agricultural machinery goes mainly to Argentina, the greatest farming country of the southern hemisphere, mining machinery enters the western mountain regions, lumber goes chiefly to Argentina and Uruguay, countries lacking in forest products, flour enters the tropical countries and Bolivia, and textiles move into the north coast countries and the temperate portion of the continent.

In all these lines of imports, except cotton textiles, the possibilities of expansion are favorable because of the lack of manufacturing on the continent. These possibilities will be limited mainly by the effects of competition from other leading manufacturing countries like the United Kingdom, Germany and to a smaller extent France and Belgium. United States' investments, machinery, and men are paving the way for larger and larger commercial expansion in our neighbor republics beyond Panama.

TRADE WITH THE UNITED KINGDOM

While the United Kingdom had 27 per cent of the trade of South American



FIGURE 30.—The large British investments in Argentine railways, British commercial concerns, and the English and Scotch elements of the population in the Patagonian sheep regions serve to turn the chief current of the Argentine wool trade to the textile mills of the United Kingdom, mills which demand increasing amounts of this raw material.

republics in 1910, she accounted for only 22 per cent in 1921-23. Before the war the United Kingdom had long been the leading nation in South American trade owing to (1) the advantage of an early start, (2) excellent British steamship services to South American ports, (3) large investments in South American enterprises, and (4) large numbers of British commercial men in South America.

For several decades after the beginning of South American expansion, no serious competitor loomed up to hamper the trading activities of the British manufacturer. Also the open British markets were the best outlets for leading products of South American countries. Furthermore, with British vessels as the chief means of transport, the currents of trade ran logically between that country and South America.

British investments have entered two fields primarily. The most important railways of Argentina which transport to the seaboard the wheat, flaxseed, corn and animal products so necessary to the factories and industrial population of the United Kingdom, have been constructed with British capital and British supplies (Fig. 29). The Central Railway of Peru, the Southern Railway of Peru, and the Antofagasta-Bolivia Railway are largely owned and operated by British interests. The controlling interests of many of the richest mines of western South America are in the hands of the British. These and other investments serve to turn to the United Kingdom significant currents of trade and to attract increasing amounts of British-made goods.

Many influential railway, mining and commercial men have entered South America along with these large investments. They have studied the wants and tastes of the people of various parts of the continent and have attempted to satisfy these. Furthermore, the representatives of the British Government in South America take an active part in fostering the most favorable trade rela-

tions between the commercial interests of their country and the South American public.

Eighty-seven per cent of the exports of South America to the United Kingdom originate in Argentina, Uruguay, Bolivia, Peru and Chile, for these countries produce the temperate foodstuffs (Fig. 30) and raw industrial materials for which England has need; to these countries go 76 per cent of the exports of the United Kingdom to South America because they have a large market for the iron and steel goods, textiles, and coal which that country can place in the market in competition with other manufacturing countries.

TRADE WITH GERMANY

Germany in 1910 was a close competitor of the United States in South American trade, not so much because of the factors favoring trade between these two parts of the world, for from this standpoint the United States had a distinct advantage, but because of the large number of Germans in various parts of the continent and the German commercial policy pursued in South America. The German banks in South America, their investments, their studies of the wants and tastes of the people, their cheap wares at low prices with favorable credit terms, and their subsidized steamship lines enabled them to gain a strong hold on South American trade.

During the war Germany lost to the United States much of her South American trade so that now she has only about 10 per cent of the trade of the continent. Yet she is gaining ground rapidly in certain regions. She is buying heavily of Argentine wool, grains, quebracho, and hides, of Brazilian coffee, and of certain west coast minerals. On the other hand large quantities of hardware, machine tools, electrical supplies, toys, school supplies, and paper enter the various South American markets at about one-half the price of American goods. Germany continues to underbid

all competitors, but how long this can continue is difficult to foretell. Only keen competition during the next few years will answer this question.

While the United States and the United Kingdom are holding fast to their lead and Germany is making strong efforts to regain her pre-war position, other countries, taking advantage of depreciated currencies, have increased their trade with South American republics. Among these are Italy, Belgium and Holland. This wider distribution of trade among countries is a favorable sign for commercial expansion of the South American republics.

SALIENT FACTS AND SIGNIFICANT TRENDS

The preceding analysis brings out a number of salient facts concerning the distribution and the trends in South American commerce.

The possibilities of commercial expansion in South America are great because (1) the continent has vast vacant areas with rich mineral deposits and with fertile, temperate and sub-tropical agricultural lands which will afford room and work for a large natural increase in population and for the thousands of immigrants now seeking entrance to the republics; (2) the agricultural areas and the mining districts can produce in larger amounts the foodstuffs and the raw industrial materials which will be needed by the manufacturing establishments and by the increasing population of the chief manufacturing nations of the world; and (3) the growth of exports in these materials and the increasing population of South America will demand more and more manufactured wares from overseas.

The exports will continue to be primarily raw industrial materials and foodstuffs, while the imports will be made up for the most part of manufactured wares of a large variety because on the one hand the excellent advantages for the production of the former and on the other the lack of fuel and power resources, labor and capital for a great develop-

ment of the manufacturing industries within the continent. The manufactures will continue to be those which almost every community must have and can make with relatively small resources cheaper than they can be procured from a distance.

South American trade will continue to move largely along north and south lines. It will consist of intra-continental trade between the tropical and temperate regions and of extra-continental trade. While the former may increase greatly, the latter will be far more important because the chief markets for the raw materials which South America can produce in large quantities and the sources of manufactured wares needed by that continent lie in the north temperate zone, chiefly in northwestern Europe and the United States.

Of the three South American commercial divisions—the Atlantic, the Pacific and the Caribbean—the Atlantic will be the primary one and the most permanent. The area tributary to the east coast includes by far the larger part of the continent owing to the westward location of the Andean barrier and the direction of the natural routes of communication; this portion has the extensive agricultural lands, developed and undeveloped; it is the area which will receive nearly all the immigrants to South America for the coming century, because of its attractive climates, economic possibilities, large European population, and general well-being; and the expanding transportation systems for further economic development will be tributary for the most part to the east coast.

While the exports from the Pacific region may increase greatly, they can never equal those of the east coast. This region is small and consists of dense tropical or temperate forests, desert expanses and rugged bleak highlands. It will not attract large numbers of immigrants. Also the future of this area is less certain than that of the southeastern part of the continent for

with the exhaustion of the several large mineral reserves the exports from this region certainly will not occupy the prominent place in the trade of the continent which they now hold.

The tropical part of South America plays a secondary rôle in the trade of the continent for the following reasons: (1) areas nearer the United States supply the tropical commodities needed in this country; (2) unhealthful conditions prevail in much of tropical South America; (3) inadequate transportation facilities exist over most of this region; (4) the low standards of living affect the inefficient laboring classes; and (5) the lack of a larger demand for tropical articles in the temperate zones plays a part.

It is destined to be of minor importance for at least a century more and probably much longer because (1) the conditions prevailing there cause the immigrant to avoid this part of the continent; (2) the wants of the people there are simple and

easily satisfied with the products at hand; (3) the Indians, the negroes and the mestizos do not give up readily their greatest luxury—leisure—for something, from their viewpoint, less desirable; (4) any large and permanent development of the tropical lowlands must be brought about by leadership and capital from cooler regions; and (5) the white man has become as yet neither completely acclimated to the physical environment of these regions nor adjusted to the social conditions.

The tropical part of South America may present large possibilities, but no great development can take place until the demand for tropical products far exceeds that of the present. It is not likely that a pressing need for these items will spring up quickly. Therefore, a great development of the truly tropical parts of South America must be relegated in all probability to a rather distant future.

THE WATER-POWER RESOURCES OF CANADA

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CANADA is in the fortunate position of having the bulk of her large water-power resources located in the coal-less provinces of Ontario and Quebec.¹ These two central provinces, rich as well in other natural resources, are larger than any other two provinces in the Canadian confederation; they are the oldest settled; their population is the most numerous; and they are the most highly industrialized. In addition, they have easy and cheap access to the markets of the world by means of the St. Lawrence waterway, a great artery of commerce extending from the Atlantic ocean through both provinces a distance of 2,340 miles into the very heart of the continent. Such a favored region, bereft of coal, would indeed be in a tantalizing situation were it not for the possession of an abundance of cheap power obtained from falling water. The location of immense water-power resources in this area is therefore a most strategic circumstance; it is far and away the most significant factor in Canadian water-power economy (Fig. 1).

AN IMMENSE AREA WITH ABUNDANT PRECIPITATION

But, while the Niagaras and Shawinigans of Ontario and Quebec are both large and spectacular, they should not be permitted to divert attention unduly from the water powers found elsewhere. Canada as a whole is well supplied with this important natural resource (Fig. 2). In fact it would be illogical to expect anything else of a country so large in area and with such a generously adequate precipitation. The land-and-water area of Canada comprises no less than 3,729,665

square miles, practically the same as that of all Europe, and nowhere except in two relatively small districts, the Dry Belt of southern British Columbia and a small portion of southern Alberta and Saskatchewan, is the rainfall too meagre for agricultural pursuits. Averaged over a period of from twenty to thirty years, the annual precipitation on the Pacific coast varies from 60.57 inches at Vancouver to 92.19 inches at Port Simpson, north of Prince Rupert. In the Prairie provinces it approximates 13.5 to 17.5 inches. Eastward, a similar long-term average registers 33.46 inches at Toronto and 40.32 at Montreal, whilst proximity to the Atlantic increases it to 46.44 inches at Fredericton, N. B. and to 47.58 at Yarmouth, N. S. (Fig. 3).

A WEALTH OF WATER POWER

Distributed over a vast area of almost three and three-quarter million square miles, this precipitation in its descent to the sea produces an amount of power so large as to be difficult of comprehension. The total waterpower resources of Canada are officially estimated at 18,255,316 h.p. at ordinary minimum flow, and at 32,075,998 h.p. dependable for six months in the year. As maximum power is not required for twenty-four hours in the day, it has been found commercially possible to install turbine capacity 30 per cent in excess of the dependable six months' horsepower. On this basis the water powers at present known will permit of a turbine installation of 41,700,000 h.p. These estimates are for falls for which the possible heads are definitely known. There are many rapids and falls, however, which are not yet re-

¹EDITOR'S NOTE.—For a review of the coal resources of Canada see article entitled "The Coal Resources of Canada," by the same author in *ECONOMIC GEOGRAPHY*, Vol. I., No. 1, March, 1925; and for a general discussion of the world's power resources, see article entitled "A World of Power," by George Otis Smith, Director of the U. S. Geological Survey in *ECONOMIC GEOGRAPHY* Vol. I, No. 2, July, 1925.



FIGURE 1.—The impressive majesty and power of falling water, as seen in the Chaudiere Falls at Ottawa before they were harnessed in concrete and steel, have not deterred the practical minded engineer from transforming their wild beauty and tremendous power to use for man's ease, comfort and convenience. (Courtesy of National Resources Intelligence Service, Dept. of the Interior, Canada.)

corded, and the utilization of existing storage facilities will increase the power estimated as available on numerous streams.

DRAINAGE DIVISIONS

The distribution of these power resources over the various sections of the country is determined by the location of the different watersheds and this, in turn, depends upon the topography (Fig. 4). To understand the conditions prevailing in this respect a glance at the relief map of Canada will prove helpful (Fig. 5). Three dominant features stand out prominently. These are the towering elevation of the western Cordilleras extending northward from the United States boundary to the Arctic ocean and sharply dividing the Pacific Coast drainage basin from that of the Great Central Plain; the great saucer-like depression in the north-central portion of the country culminating in Hudson bay into which flows the drainage of Manitoba, the

southern portions of Saskatchewan and Alberta and that large part of Ontario and Quebec known geologically as the Pre-Cambrian or Laurentian shield; and finally the deep gash made by the St. Lawrence-Great Lakes waterway, extending from the Straits of Belle Isle to Duluth at the head of Lake Superior and competing with Hudson bay for the drainage of the eastern half of Canada. The waters of the Great Central Plain not captured by Hudson bay through the Saskatchewan and Nelson rivers take their way northward through the Mackenzie river to the Arctic ocean. The Atlantic maritime drainage area comprising Nova Scotia and New Brunswick is, comparatively speaking, not of large extent and the rivers draining it are short. Good storage facilities, however, exist.

The Pacific Slope

A more detailed view of the water-power resources of these drainage basins is now in order. The Pacific area, which

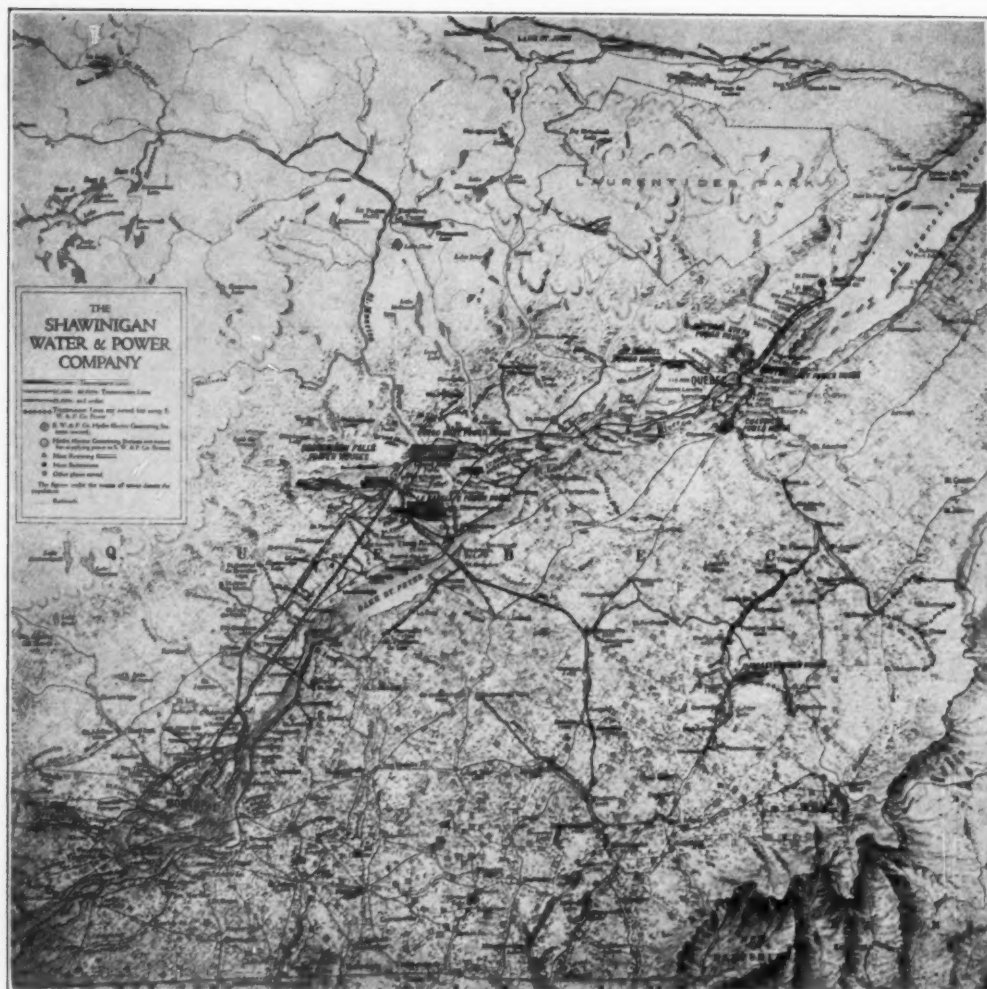


FIGURE 2.—A graphic illustration of the water-power plants along the St. Lawrence valley in Quebec and the distribution of the power generated. (Courtesy of the Shawinigan Water and Power Co.)

consists of the province of British Columbia, is favored with an abundant rainfall, and the mountainous character of practically the whole province provides exceptionally high heads, some of them exceeding 2,000 feet. Three main mountain regions running north and south, the Coast Range on the west, the Rocky Mountains on the eastern boundary and the Selkirk Mountains to the west of the latter, insure great variety in precipitation and temperature. In the coast region precipitation is heavy, at many points exceeding 100 inches annually. It becomes gradually less as the

Rockies are approached. In these mountains and in the Selkirks, the snowfall is almost unbelievably heavy: at Glacier, for instance, it has amounted to 457 inches in a single year, and 100 inches at many points is not unusual.

The total available water power in British Columbia at minimum flow is estimated at 1,931,142 h.p., and at 5,103,460 h.p., dependable for six months. The power developed at the end of 1925 amounted to 414,702 h.p. The undeveloped and unexplored nature of large areas of the province and the remarkable facilities for increasing power

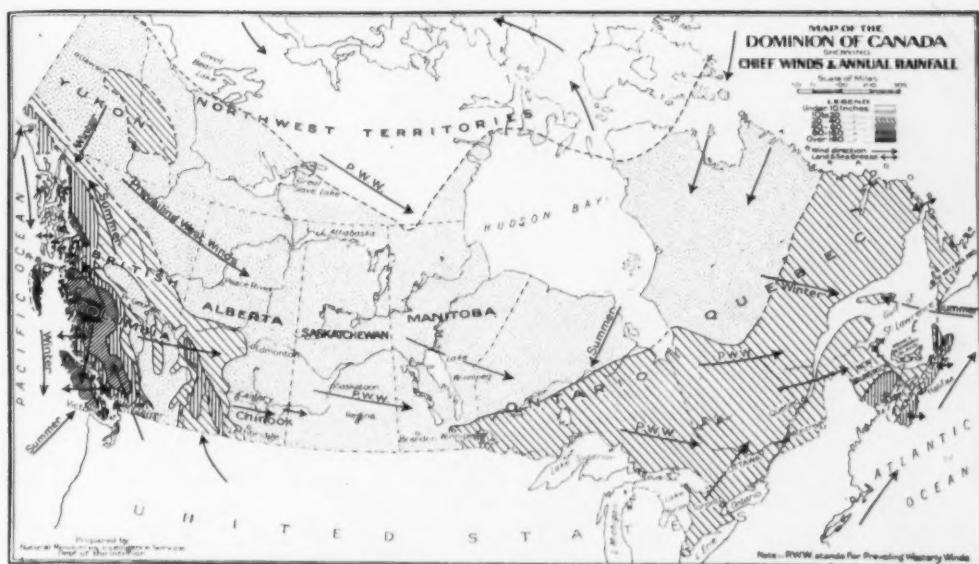


FIGURE 3.—The copious rainfall, the relatively varied relief, and the lakes for storage and regulation, combine to afford Canada a supply of water power adequate to her present and prospective needs. (Courtesy of Natural Resources Intelligence Service, Dept. of the Interior.)

development through storage that, in many cases, have not been fully allowed for, make it certain that the estimate of potential power given above errs in being too conservative.

Power development has reached its largest proportions adjacent to centres of population, principal among these being the districts around Vancouver, Victoria and Nelson. Much power is also de-

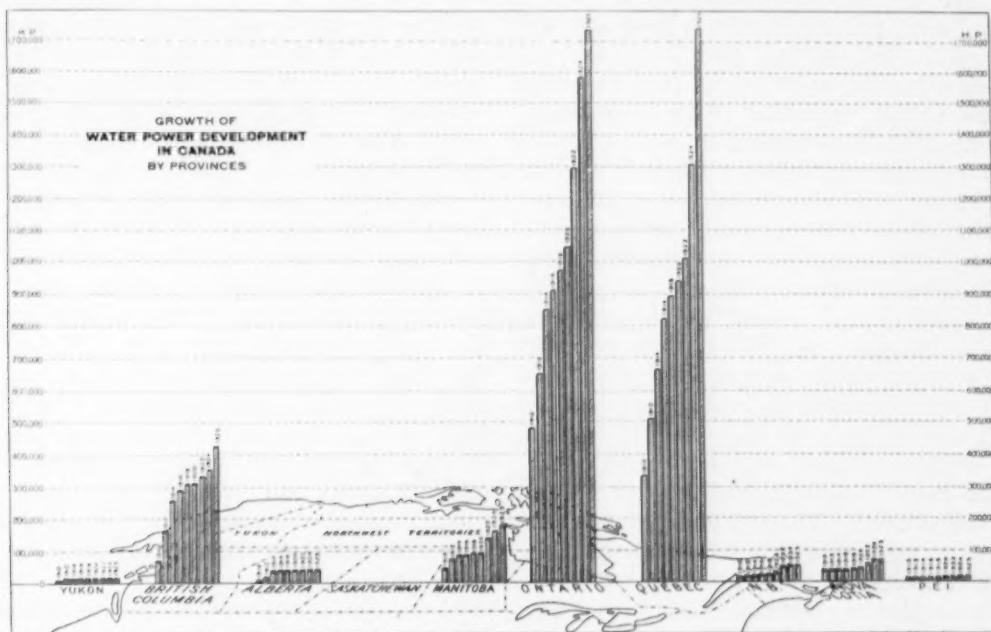


FIGURE 4.—Besides the development of water power presented by this chart, the areas of large and progressive population, available capital, active industry, and continued prosperity are indicated in a more suggestive way. (Courtesy of Water Power and Reclamation Service, Dept. of the Interior, Canada.)



FIGURE 5.—The great water-power possibilities of Canada result from two basic geographic factors—high relief throughout almost the whole Dominion, and a widely distributed, copious rainfall. Wealth of raw materials and dense concentrations of population, and abundance of capital, all near at hand, constitute the economic factors, which tend to the utilization of the power. (Adapted from map supplied through courtesy of Water Power and Reclamation Service, Dept. of the Interior, Canada.)

veloped primarily for industrial uses, mainly for mining and smelting, the manufacture of pulp and paper and for use in fish canneries. One of the most important power zones is located around Vancouver. Within a radius of 100 miles of this city, it has been estimated that there is nearly one million horsepower dependable for six months in the year, and this does not include the many considerable sites on Vancouver island. The British Columbia Electric Railway Company, which supplies electric power to this district, has now an installed capacity of 171,500 h.p. and important additions that will largely increase this are under way at Allouette lake and at Bridge river. The new Bridge River development, located on Seton lake, 135 miles north of Vancouver, will be one of the largest on the continent. The ultimate development will be 700,000 h.p., and power will be transmitted at 165,000 volts pressure, the highest so far used in Canada.

The city of Victoria and environs is supplied with water power by the same company as supplies Vancouver. Developments aggregating 29,600 h.p. are used. One of these, on the Jordan river, utilizes a head of 1,145 feet (Fig. 6).

The mining industry makes extensive use of water power in the district surrounding Nelson. Here the West Kootenay Power and Light Company, controlled by interests allied with the Consolidated Mining and Smelting Company and the Canadian Pacific Railway, has power installations totalling 77,900 h.p. (Fig. 7). The East Kootenay Power Company's developments on the Bull and Elk rivers, supplying Fernie, Cranbrook and other towns in the Crowsnest coal mining region with electric energy, total 22,200 h.p.

In the coastal region several large mining enterprises have developed power from water. At Britannia, on Howe Sound, north of Vancouver, the Britan-

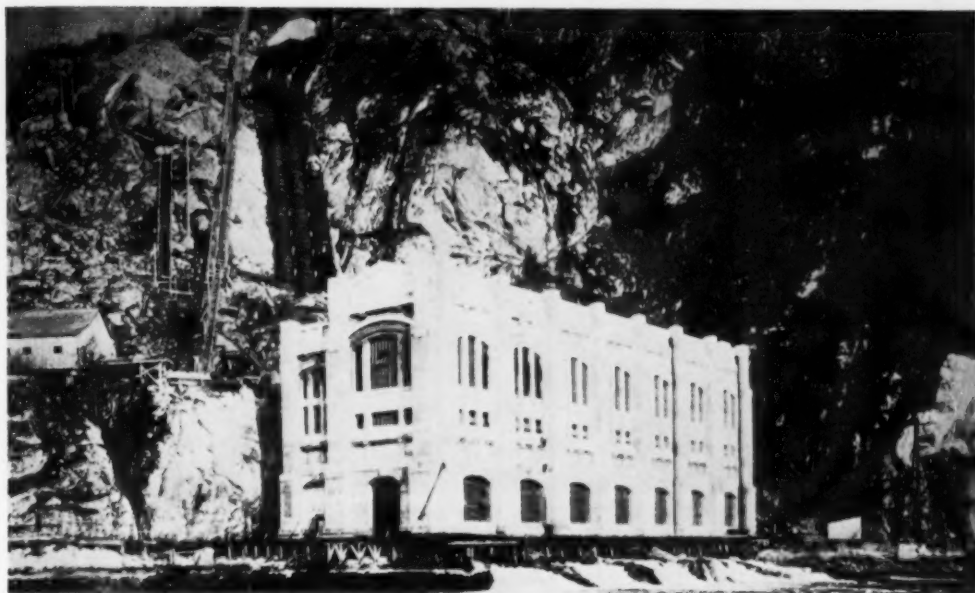


FIGURE 6.—The British Columbia Electric Railway Co., Ltd., combines art, science, and utilitarianism in its superb 40,500-horsepower plant, Coquitlam-Buntzen Development No. 2. (Courtesy of British Columbia Electric Railway Co., Ltd.)

nia Mining & Smelting Company utilizes 22,350 h.p., the most of which is developed under a 1920-foot head, and at Anyox the Granby Company uses 13,400 h.p. developed from water (Fig. 8). On Vancouver island, Canadian Collieries (Dunsmuir) Ltd., have a 12,000 h.p. installation on the Puntledge river. Many other mining companies scattered throughout the province have developed near-by water powers for use in mining and smelting operations.

A wealth of forest resources has attracted many pulp and paper companies to British Columbia, and these find cheap water power one of the first essentials of their operation. Three such companies operate six mills in the province, the largest of which are the Pacific Mills generating 26,850 h.p. at Ocean Falls and the Powell River Company, Ltd., utilizing 24,000 h.p. on the Powell river.

Large future employment of water power is foreseen in the electrification of railways passing through the mountains where heavy grades and the frequent occurrence of tunnels make electrical operation desirable. Electrification of

portions of the lines of the Canadian Pacific Railway in the mountain sections of British Columbia is a possibility of the near future.

The Prairie Provinces

Eastward of the Rockies and extending to the waters of Hudson bay lie the three prairie provinces of Alberta, Saskatchewan and Manitoba. Except in their more northerly and sparsely settled portions, water-power resources are not large. In the purely prairie sections, the streams are of gradual gradient and somewhat sluggish flow, whilst extreme variation in run-off is also experienced. This country is fortunate, therefore, in being in a position to draw upon the water-power resources of the mountains and foothills to the west and of the Laurentian plateau to the north and east.

The water power available in these three provinces is estimated at 4,260,000 h.p. under conditions of ordinary minimum flow, and at approximately 8,000,000 h.p. at ordinary six-months' flow. About three-quarters of this power belongs to Manitoba and the remainder is



FIGURE 7.—The 34,000-horsepower development of the West Kootenay Power and Light Co., Ltd., at Upper Bonnington on the Kootenay River, British Columbia, is extensively used for mining and smelting purposes. (Courtesy of West Kootenay Power and Light Co., Ltd.)

equally divided between Saskatchewan and Alberta. The turbine installation is 34,107 h.p. in Alberta, and 183,925 in Manitoba, while in Saskatchewan it is negligible.

The river most prolific of power in this whole territory is the Nelson, which,

following a northward course of some 430 miles, drains Lake Winnipeg into Hudson bay. Lake Winnipeg, 9,500 square miles in area, receives the run-off from more than 400,000 square miles of territory and acts as a natural collecting and regulating basin. The Nelson has thus a

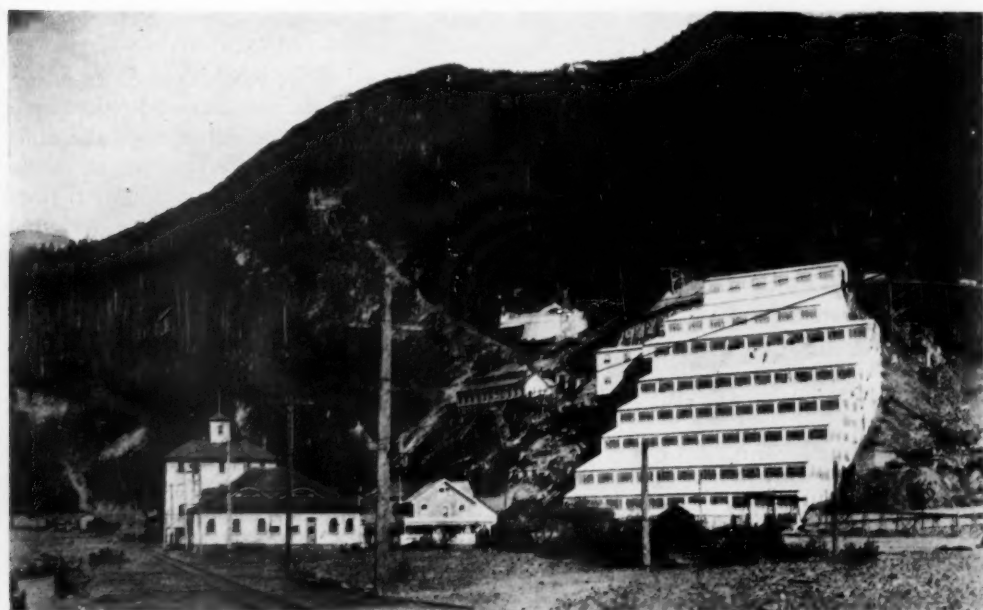


FIGURE 8.—An efficient utilization of power at Britannia Beach where many thousands of horsepower are produced for the concentration mill and associated industries. (Courtesy of the Britannia Mining and Smelting Co., Ltd.)

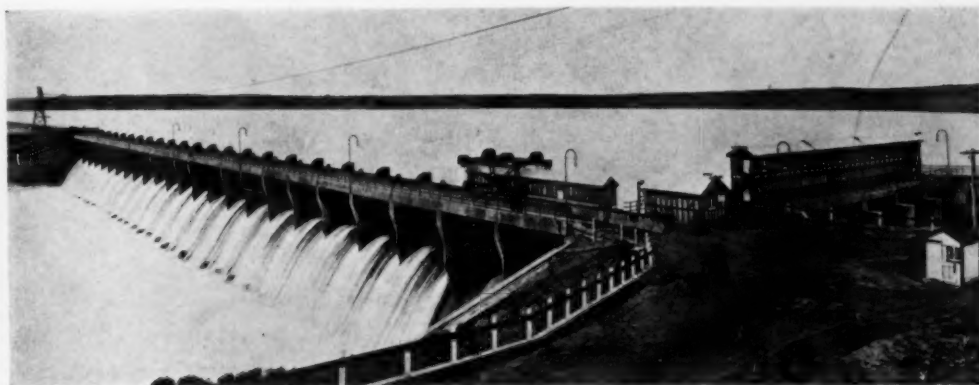


FIGURE 9.—Where Water Power and Irrigation join in purpose and project, there man's efforts yield most richly; this junction at Bassano Dam, Bow River, Alberta, bodes naught but prosperity for the district. (Courtesy of Dominion Water Power and Reclamation Service, Dept. of the Interior, Canada.)

high and regular discharge, and at twenty-two sites along its course it is estimated there are total possibilities of 2,440,000 h.p. under conditions of ordinary minimum flow, or 3,660,000 h.p. under ordinary six-months' flow conditions.

While the Nelson is the greatest, the Winnipeg, because of its proximity to a large centre of population, is at present the most important power river. Originating in a country liberally supplied with large lakes, it has a very uniform natural flow. This uniformity has been increased by storage dams in the upper waters and will become even more marked as further storage is provided. Moreover, the fall in the river occurs in such a manner that the whole head can be concentrated at nine desirable sites, in several of which exceptional pondage facilities permit of largely increasing peak-load capacities.

Of the nine sites, six are still undeveloped. These will have a capacity of 230,000 h.p. when the storage possibilities of the watershed are fully utilized. The total capacity of all the sites on the river with full utilization of storage will, in all probability, exceed 500,000 continuous horsepower.

Other power rivers of magnitude in the prairie provinces are: in Alberta, the Slave, Peace and Athabasca rivers; in Saskatchewan, the Churchill, Reindeer,

and the Saskatchewan; and in Manitoba, the Churchill, and Saskatchewan. These rivers exhaust the largest portion of the water-power resources. Certain other rivers, owing to their location in regard to markets, have important power resources, as, for instance, the Bow river above Calgary, which has, in addition to two developments, four undeveloped sites with an aggregate potentiality of 15,000 h.p., minimum, or 37,000 h.p. for six months. The power value of these Bow river sites would be greatly enhanced if, as has been suggested, storage reservoirs supplying high-head developments in the mountains nearby were provided.

With the exception of some small plants, the power developments of the three provinces are confined to the Bow and Winnipeg rivers (Fig. 9). The Calgary Power Company has on the former river, two developments, the first operating under a 70-foot head at Horse-shoe falls, where 20,000 h.p. is installed, and the other at Kananaskis falls, two miles upstream, where 11,600 h.p. is installed under the same head. These plants supply power to the city of Calgary, the village of Cochrane and the Canada Cement Company at Exshaw. Low winter-flow necessitates the use of a supplementary fuel power plant in Calgary during that season (Fig. 10).

In Manitoba there are three develop-



FIGURE 10.—The Calgary Power Co., Ltd., has developed a 20,000-horsepower plant at Horsehoe Falls, Bow River, Alberta, one of the finest in that section. (Courtesy of Dominion Water Power and Reclamation Service, Dept. of the Interior, Canada.)

ments of the first magnitude on the Winnipeg river. The earliest of these to be placed in operation was that of the Winnipeg Electric Railway Company on

the Pinawa, a high-water overflow channel which was enlarged to carry water to a power station having an installation of 37,800 h.p. The second plant, that of



FIGURE 11.—The City of Winnipeg's big municipal power plant with a present capacity of 88,000 horsepower and an ultimate capacity of 100,000 horsepower. This is the Point du Bois development. (Courtesy of the City of Winnipeg.)

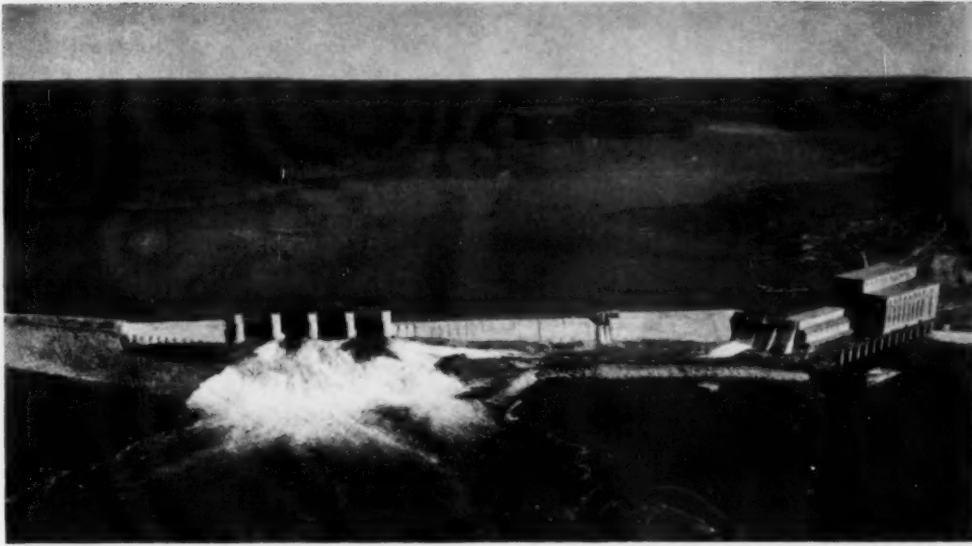


FIGURE 12.—A prairie province development, the Great Falls plant on the Winnipeg River of the Manitoba Power Company, Ltd., with a present capacity of 56,000 horsepower, and a potential capacity of 168,000 horsepower. (Courtesy of Manitoba Power Co., Ltd.)

the city of Winnipeg at Point du Bois, has a present installation of 88,000 h.p. and an ultimate designed capacity of 100,000 h.p. (Fig. 11). A recent development of 56,000 h.p., one-third of the ultimate designed capacity, has been made at Great Falls by the Manitoba Power Company, a subsidiary of the Winnipeg Electric Railway Company (Fig. 12). Most of the power from these three developments is distributed, chiefly in Winnipeg and its environs, by the city and the above-named company, but a portion is also distributed by the Manitoba Power Commission to Portage la Prairie and other towns in the southern part of the province.

Important developments, both proposed and under way, in the pulp and paper industry in southern and eastern Manitoba make it probable that in a comparatively few years all the power on the Winnipeg river will be in use. The development of the other power rivers of the Prairie provinces, the more important of which are in the more northerly, sparsely settled territory, will doubtless be largely in conjunction with the development of the other natural resources of these northerly regions. The exis-

tence of pulpwood forests insures the northward extension of the pulp and paper industry, while mineral discoveries made over a wide area give promise of an important mining industry throughout the whole territory. The Flin Flon copper-gold mine, said to possess one of the largest ore deposits of its kind in the world, is an outstanding example of such discoveries. The exploitation of these and other resources will undoubtedly bring into use a large part of the water powers of the prairie provinces.

Ontario and Quebec

The provinces of Ontario and Quebec possess two-thirds of the water power of Canada. Since they are parts of the same great drainage system it is both convenient and logical to deal with them physiographically as one area. Extending over more than a million square miles of territory they exemplify, in the features affecting water powers, a wide range of characteristics. Excepting the coastal plains bordering James and Hudson bays and a comparatively narrow strip of level agricultural country to the north of lakes Erie and Ontario and along the St. Lawrence river, the whole



FIGURE 13.—The De Cew Falls Development of the Dominion Power and Transmission Co., Ltd., on the Welland Canal near Hamilton, Ontario. Capacity, 45,000 horsepower. (Courtesy of Dominion Water Power and Reclamation Service.)

of the two provinces is occupied by the beautiful and rugged Laurentian plateau.

The Laurentian Plateau

"The striking features of the Laurentian plateau are innumerable lakes, large and small, with intervening rounded rocky elevations,—wooded, in their natural conditions to the south, rising above the tree line to the northward; while in the far north on both sides of Hudson bay, hills and valleys become eventually characterized by grasses, mosses and lichens alone, constituting the great 'barren lands' of North America. . . . Its average elevation of 1,500 feet is notably greater than that of the adjacent lands and is maintained with considerable regularity, but its surface is everywhere hummocky or undulating. Away from its borders, the streams draining it are, as a rule, extremely irregular and tortuous, flowing from lake to lake in almost every direction. . . . In its southern parts, it carries forests of great value and its mineral resources are already known in some places to be very important. It constitutes, moreover, a gathering ground for many large and almost innumerable small rivers and streams, which, in the source of power they offer

in their descents to the lower adjacent levels, are likely to prove, in the near future, of greater and more permanent value to the industries of the country than an extensive coal field" (Fig. 13).²

Indeed, it is difficult to overestimate the beneficial influence of the forests, lakes and muskegs in the regulation of the water supply of the Laurentian country. Together with the existence of Nature's ideal gathering and storage basin in the Great Lakes, it makes this part of North America perhaps the greatest water-power area in the world.

Available and Developed Power

This area is capable of producing under conditions of minimum flow nearly twelve million horsepower, allocated 4,950,300 h.p. to Ontario and 6,915,244 h.p. to Quebec. Translated into power dependable for six months in the year, this represents 6,808,190 h.p. for Ontario and 11,640,052 h.p. for Québec. The latter province at the end of 1925 had a turbine installation of 1,747,386 h.p., while that in Ontario was 1,784,842 h.p.

² George M. Dawson, C. M. G., F. R. S., in *The Physical Geography and Geology of Canada*, published in 1897.

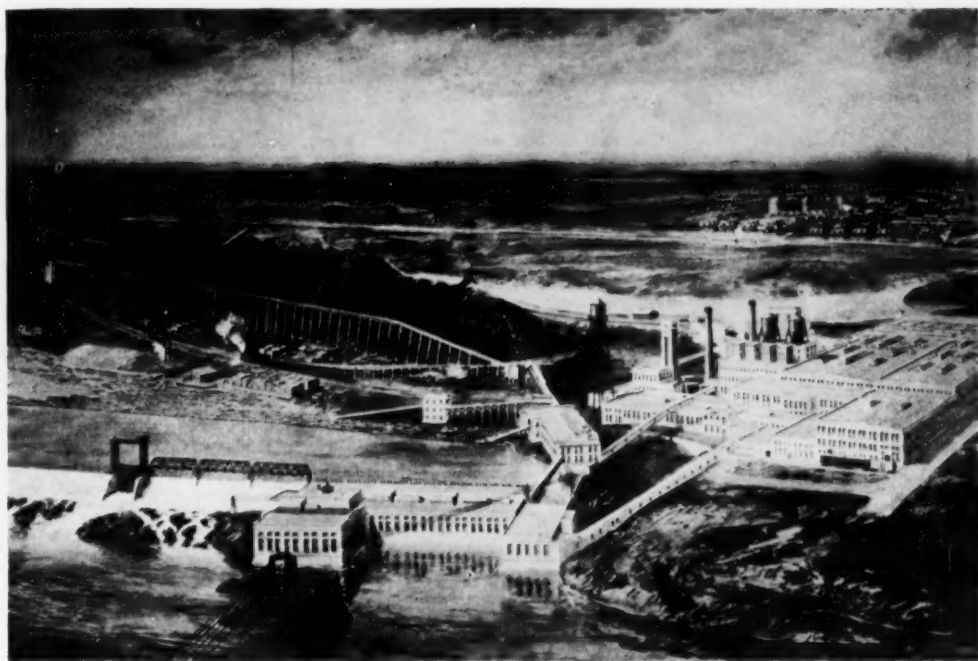


FIGURE 14.—Iroquois Falls Power Plant and Paper Mill, Abitibi River, Ontario, with capacity of 20,000 horsepower. (Courtesy of Abitibi Power and Paper Co., Ltd.)

Hudson Bay Tributaries

Data respecting waterpower on many of the streams flowing into James and Hudson bays are meagre. It has been tentatively estimated that, in Ontario, the rivers flowing into these bays have a minimum power capacity of 552,000 h.p. and that, including the District of Patricia, a total of 1,000,000 h.p. may be physically capable of development. Many powers in this district are applied to mining and pulp and paper developments. The largest developments in respect of the latter are those of the Abitibi Power and Paper Company which develops 106,000 h.p. at three sites on the Abitibi river (Fig. 14). Fourteen other undeveloped sites on the same river are capable of producing 185,000 h.p. minimum and 274,000 h.p. dependable for six months. At four sites on the Mattagami 37,150 h.p. have been developed, and eleven undeveloped sites are rated at 114,000 h.p. minimum and 220,000 h.p. for six months.

In Quebec there are a number of large

rivers tributary to these bays concerning which, however, the available information is scanty and indefinite. Estimates have been made respecting the Nottaway, Rupert, Eastmain, Big and Great Whale rivers, and it is considered reasonable to place their combined power resources at 800,000 h.p. minimum. Tributary to Ungava bay, the Koksoak river is thought to have a minimum capacity of 300,000 h.p.

A Little Known Region

The only river entering the Atlantic from northern Quebec of which any information is available is the Hamilton. Explorers state that 250 miles from its mouth there is a fall at which, with an efficient head of 900 feet, an estimated 400,000 minimum horsepower could be obtained. Although large deposits of iron ore are found in the vicinity, this power site will probably remain undeveloped until the area is opened up, probably many years hence. Muskrat falls, 25 miles from the mouth of the river, has more modest but probably more valuable



FIGURE 15.—The vibrant maiden beauty of Cameron Falls on the Nipigon River has been transformed to the staid matronly efficiency of a great power plant, productive of a proud progeny of industries. (Courtesy of Hydro-electric Power Commission of Ontario.)



FIGURE 16.—Cameron Falls Development of the Hydro-Electric Power Commission of Ontario, on the Nipigon River, Ontario. Capacity 75,000 horsepower. (Courtesy of Dominion Water Power and Reclamation Service, Dept. of the Interior, Canada.)

present possibilities estimated at 45,000 h.p.

New Ontario

Turning now to the extreme western portion of this drainage basin, we find a group of important water powers aggregating several hundred thousand horsepower on the Winnipeg and English rivers in Ontario. The industrial importance of these has been greatly enhanced in recent years by activity in developing pulp and paper resources in the districts adjacent. Large flour-milling operations are also carried on with the aid of water power at Kenora. Tributary lakes afford possibilities through storage. Tributary to Lake Superior the Nipigon, Kaministiquia, White, Magpie, Michipicoten and Montreal rivers have power possibilities of importance. On the first-named river 60,000 h.p. minimum can be developed besides the 75,000 h.p. available at Cameron falls (Figs. 15 and 16), which has been developed by the Hydro-Electric Power Commission of Ontario. This power, together with 34,250 h.p. developed at Kakabeka falls on the Kaministiquia by a private company, is used principally at Port Arthur and Fort William, where large pulp and paper, grain elevator and milling demands exist.

The St. Mary river connecting Lake Superior with Lake Huron has a total capacity of 53,500 h.p. available for Canadian use, of which 42,000 h.p. has been developed. Rivers flowing into upper Lake Huron and Georgian bay have, in the aggregate, large water-power resources some of which have been developed for mining and smelting and for the manufacture of pulp and paper. The rivers tributary to lower Lake Huron and Lake Erie do not possess large power possibilities, and the agricultural occupation of the fertile country through which they run has caused a flashy run-off which has greatly militated against their value as sources of power.

Niagara

The spectacular falls and rapids of the Niagara river are capable of generating

5,400,000 h.p. if the total flow of the river were utilized for power purposes without regard for the preservation of the scenic beauty of the falls. A treaty with the United States, however, limits the division for power purposes to 36,000 cubic feet per second for Canada and 20,000 cubic feet per second for the United States. Under these limitations Canada's total resources amount to a little over a million horsepower, the major portion of which has been already developed. The Niagara system is the largest of those operated by the Hydro-Electric Power Commission of Ontario. It distributes power at low cost all over south-western Ontario as far west as Windsor, 242 miles distant, the result of which has been to make this area very prosperous industrially (Figs. 17 and 18).

The power resources on the small rivers flowing into Lake Ontario are not large, although a power system of importance has been developed from water powers along the Trent canal. Here the Hydro-Electric Power Commission of Ontario has developed 58,000 h.p., and 11,000 h.p., minimum, is still awaiting development.

St. Lawrence River Power

The St. Lawrence river, not only on account of its enormous discharge but also because of the almost perfect natural storage afforded by the Great Lakes which feed it, is one of the most important power rivers of the world (Figs. 19 and 20). This great river is capable of furnishing over 3,500,000 h.p. of which less than 1,500,000 h.p. is in the international reach and would have to be apportioned between Canada and the United States. The growing demands of the adjacent territory make it certain that development on a large scale will be undertaken within the next few years.

Of the many large rivers flowing into the St. Lawrence from the northern Laurentian plateau three should be especially mentioned, the Saguenay, the St. Maurice and the Ottawa, the latter being an interprovincial river between



FIGURE 17.—Bird's eye view of the world's largest hydro-electric power development, the Queenston-Chippewa Power Development project near Niagara Falls, Ontario. (Courtesy of Hydro-Electric Power Commission of Ontario.)

Ontario and Quebec. Regulated flow in the St. Maurice and the Saguenay rivers would give over 1,500,000 twenty-four-hour horsepower, much of which is still available for development and convenient

to tide water. All three rivers have fostered a great lumber and pulp industry in their valleys, but of late years the application of their power to a broader industrial field has been in evidence.



FIGURE 18.—The great power house of the Hydro-Electric Power Commission of Ontario in the gorge of the Niagara River at Queenston. Concrete-encased steel pipes carry the water from the screen-house at the top of the cliff to the huge turbines at the foot. It constitutes the largest single hydro-electric plant in the world, with an ultimate capacity of 600,000 horsepower from ten generating units of 60,000 horsepower each. (Courtesy of Hydro-Electric Power Commission of Ontario.)

The Ottawa District

On the Ottawa river, development has been confined to about 125,000 h.p. in the vicinity of the city of Ottawa and 20,000

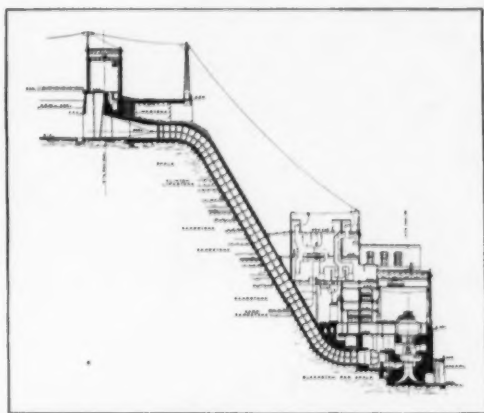


FIGURE 19.—Diagrammatic cross-section of the screen-house, pipe lines, and power house at Queenston. (Courtesy of Hydro-Electric Power Commission of Ontario.)

h.p. on the portion known as the Quinze river, leaving still unutilized 630,000 h.p. on a basis of ordinary minimum flow and probably twice that amount with adequate storage. Some storage works in the upper reaches of the river have already been constructed, adding materially to the power capacity of present installations. It is from the headwater tributaries of the Ottawa that the silver and gold mines of northern Ontario draw their supplies of electrical and compressed-air energy. The tributaries of this river on the Quebec side are of much greater importance as regards water-power resources than those on the Ontario side. One of the largest developments on the northern tributaries is now under construction on the Gatineau river at two points near Chelsea, a few miles north of the city of Ottawa, by the International Paper Company (Fig. 21). At these two points there will be an

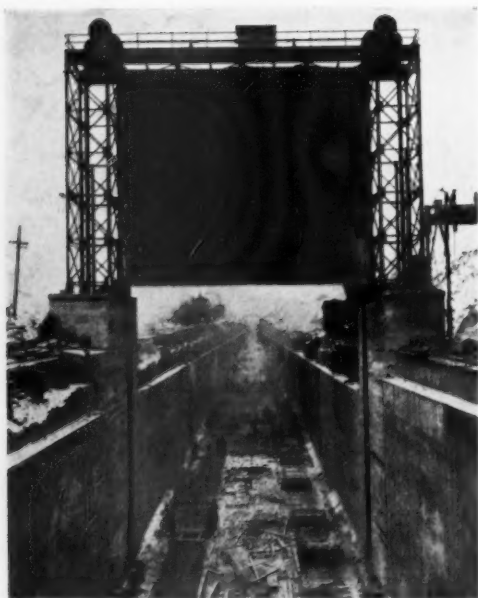


FIGURE 20.—A section of the immense canal, concrete lined, that conveys the waters of Lake Erie to the turbines of the Queenston-Chippewa Power Plant at Queenston. In the excavation of this canal electrically operated shovels were used, five of them the largest in the world, each capable of loading, in one and a half minutes, a car of 60 cubic yards standing 60 feet above the shovel. The massive control gate in the foreground is electrically operated. (Courtesy of Hydro-Electric Power Commission of Ontario.)

initial installed capacity of 200,000 h.p. with provision for a larger ultimate development. These plants will provide power for a large pulp and newsprint mill having a capacity of 450 tons of newsprint daily.

The Montreal District

The Montreal district is generously supplied with hydro-electric power from a number of plants in the vicinity. An authority on water power has described Montreal as a city which "enjoys a more bountiful supply of cheap power than any other city in the world." The Montreal Light, Heat and Power Company owns and operates four plants, three of which are on the St. Lawrence, at Cedars rapids, Lachine rapids and Soulanges canal, and the fourth on the Richelieu river at Chambly. The aggregate capacity of these is 252,000 h.p. A certain amount of power is also received from Shawinigan falls, almost a hundred miles distant. Augmentation of the present supply is possible from the further utilization of the rapids of the St. Lawrence between the city and Lake St. Francis, the total available being approximately 2,000,000



FIGURE 21.—The turbulent waters of Chelsea Falls, on the Gatineau River, just north of the city of Ottawa, Canada's capital, where the International Paper Company is constructing a large power plant and newsprint mill. (Courtesy of International Paper Co.)



FIGURE 22.—Chaudiere Falls on the Ottawa River supplies an aggregate of 100,000 horsepower from its various installations. A concentration of pulp, paper, and other industries in Ottawa and Hull has resulted from this project. (Courtesy of Dominion Water Power and Reclamation Service, Dept. of the Interior, Canada.)

h.p. Some of the Ottawa river powers are also within economic transmission distance (Fig. 22).

The Eastern Townships are particularly well supplied with hydro-electricity. The Southern Canada Power Company, owning five sites on the St. Francis river capable of developing over 100,000 h.p., has an extensive transmission system distributing some 54,000 h.p. already developed, as well as power purchased from the Montreal Light, Heat and Power Company. Power from Shawinigan is also distributed in this area (Fig. 23).

St. Maurice River Power

The St. Maurice river, one of the largest tributaries of the St. Lawrence, affords power at Shawinigan falls for the largest concentration of industrial developments in the province. The ex-

tensive installation here by the Shawinigan Water & Power Company is, to a large extent, a result of the work on the regulation of the flow of the river by the Quebec Streams Commission. The various plants at this site have a total capacity of some 260,000 h.p. under a head of 148 feet. The greater portion of this is for hydro-electric production, but a large pulp mill as well operates hydraulically from this fall. The St. Maurice also supplies power to another of the largest hydro-electric plants in the province a short distance from Shawinigan at Grand Mère, where an installation of 176,000 h.p. operates under a head of 76 feet. A portion of La Tuque power on the same river is also used, while a further 120,000-h.p. hydro-electric plant under a head of 65 feet is situated at Gabelle, a short distance below Shawinigan falls (Fig. 24.)



FIGURE 23.—Power houses and flumes of the Shawinigan Water and Power Co., Shawinigan Falls, one of the great power developments on the St. Maurice River, Quebec. It generates 191,500 horsepower. (Courtesy of Shawinigan Water and Power Co.)

A portion of the St. Maurice power is used locally for the pulp and paper and electro-chemical industries, and large amounts are transmitted to Montreal, Quebec and to the Eastern Townships, where it is extensively used in asbestos mining (Fig. 25). Other sites on the St. Maurice and its tributaries await development under heads of from 50 feet to 200 feet. Direct tributaries of the St. Lawrence in the vicinity, not previously mentioned, such as the Assomption,

Ouareau, Maskinonge and Batiscan rivers, contain numerous possibilities (Fig. 26).

The Lake St. John District

The Chicoutimi or Lake St. John district abounds in water-power possibilities and some of the most important pulp and paper mills of the province have been attracted here by this valuable source of energy. Lake St. John is a natural catch basin for the waters of several large

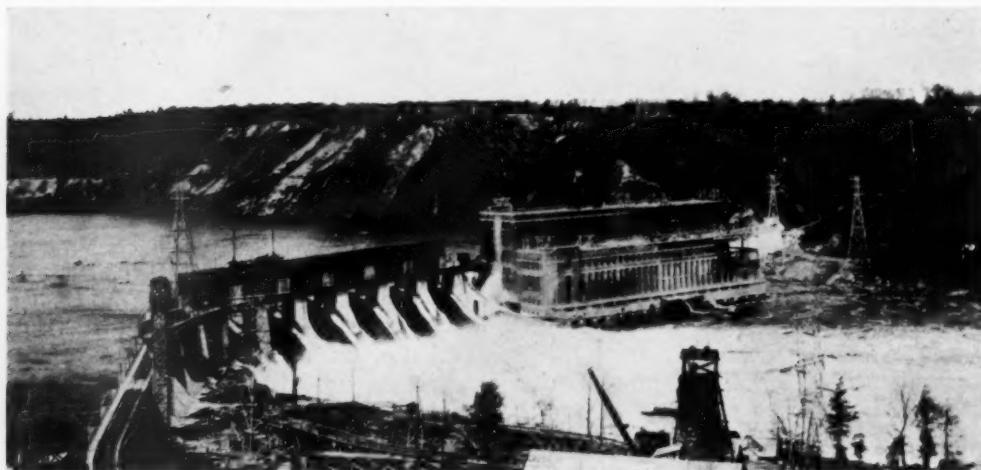


FIGURE 24.—La Gabelle Plant of St. Maurice Power Co., Ltd., on the St. Maurice River, Quebec. Capacity 120,000 horsepower. (Courtesy of St. Maurice Power Co., Ltd.)



FIGURE 25.—The Gouin Dam, the largest water-power storage dam in the world, controls the waters of the upper St. Maurice River in Quebec. This storage reservoir impounds 160 billion cubic feet of water. It regulates the water supply to the great power plants on the lower St. Maurice, about Shawinigan Falls and Three Rivers. (Courtesy of Quebec Streams Commission.)

ivers on most of which individually there are important water powers aggregating about a quarter of a million horsepower at minimum flow and twice that amount dependable for six months. Power is being utilized on the Chicoutimi, Sable, Shipshaw, Ha! Ha!, and

other rivers in installations aggregating several hundred thousand horsepower. The power on the first two rivers has been lately increased by the thirteen-billion cubic foot reservoir at Kenogami constructed by the Quebec Streams Commission.

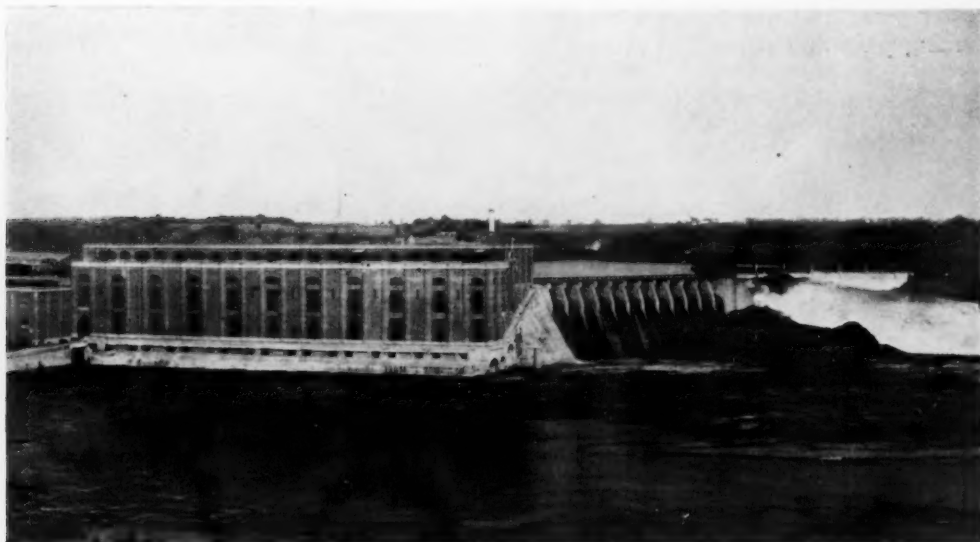


FIGURE 26.—The Power Plant and Dam of the Laurentide Power Co., Grandmère, Quebec, on the St. Maurice River. This one plant generates 164,000 horsepower. (Courtesy of Shawinigan Water and Power Co.)



FIGURE 27.—I.le Maligne Development of the Duke-Price Power Co., Ltd., on the Saguenay River, Quebec. Present capacity 360,000 horsepower; ultimate capacity 450,000 horsepower. (Courtesy of Duke-Price Power Co., Ltd.)

Large Saguenay Developments

One of the largest hydro-electric developments of the province, of 540,000 h.p. ultimate capacity, is under construction by the Duke-Price Power Company at the Grand Discharge of Lake St. John in this district (Fig. 27). To date 360,000 h.p. utilizing a head of 110 feet, has been installed. This company was promoted, by the late Sir William Price, prominent Canadian pulp and paper manufacturer and the late James B. Duke, tobacco magnate, whose heirs control it. The power generated will be used largely in making pulp and paper. A second site

is under construction at Chute à Caron on the Saguenay river, where the Aluminum Company of Canada is installing 240,000 h.p., the ultimate designed capacity of the plant being 800,000 h.p., for the manufacture of aluminum at this site. The raw material, bauxite ore, will be brought in by boat from British Guiana, thus exemplifying the advantages possessed by a water-power development located at tide-water.

North Shore Powers

The rocky north shore of the St. Lawrence below the Saguenay, also possesses large rivers offering attractive



FIGURE 28.—A New Brunswick Power Plant, small but significant; the 9,000 horsepower plant of the Bathurst Co., Ltd., on the Nipisiguit River. (Courtesy of Bathurst Co., Ltd.)



FIGURE 29.—The undeveloped power site at Grand Falls, on the St. John River, New Brunswick. (Courtesy of Dominion Water Power and Reclamation Service, Dept. of the Interior, Canada.)

water-power sites. These have power resources estimated at 850,000 h.p. minimum and 1,500,000 h.p. dependable for six months. Some of these rivers are being utilized to a limited extent by the pulp, paper and lumbering industries. The most important ones include the Outardes, Bersimis, Manicouagan, Romaine, St. Augustin and Natashkwan.

The Maritime Provinces

The Atlantic maritime provinces of Prince Edward Island, New Brunswick and Nova Scotia differ widely, both

geologically and geographically, from Ontario and Quebec. For one thing the rugged and broken Laurentian formation is not continued in them. The watersheds, also, are smaller, the climate is milder and the precipitation (40 to 55 inches annually) is greater. However, this high precipitation, coupled with comparatively high altitudes approaching the sea shore and exceptional natural storage facilities, combine to produce water-power potentialities in New Brunswick and Nova Scotia of worth-while magnitude. The existence of large coal deposits has, no doubt, retarded development somewhat. Prince Edward Island, a level agricultural province has no water powers of any size, not more than 3,000 h.p. at minimum flow being possible of development from all sites on the Island.

New Brunswick

New Brunswick has resources amounting to 50,406 h.p. at minimum flow and 120,807 h.p. dependable for six months in the year. There has been developed 44,631 h.p., a considerable proportion of which is in small sites utilized for local requirements. The largest individual power site is at Grand falls on the St. John river, where, under a 130-foot head,



FIGURE 30.—A small water power plant in Nova Scotia, the Malay Falls development of the Nova Scotia Power Commission at East River Sheet Harbor; capacity 5,500 horsepower. (Courtesy of Nova Scotia Power Commission.)

WATER POWERS OF CANADA, AVAILABLE AND DEVELOPED*

Province	Available 24-Hour Power at 80 Per Cent Efficiency		Turbine Installation
	At Ordinary Minimum Flow	At Ordinary 6-months flow	
British Columbia	1,931,142 h.p.	5,103,460 h.p.	414,702 h.p.
Alberta	475,281	1,137,505	34,107
Saskatchewan	513,481	1,087,756	35
Manitoba	3,270,491	5,769,444	183,925
Ontario	4,950,300	6,808,190	1,784,842
Quebec	6,915,244	11,640,052	1,747,386
New Brunswick	50,406	120,807	44,631
Nova Scotia	20,751	128,264	65,327
Prince Edward Island	3,000	5,270	2,274
Yukon and Northwest Territories	125,220	275,250	13,199
Canada	18,255,316	32,075,998	4,290,428

Developed Water Power in Canada

As at Dec. 31, 1925

Province	Turbine Installation in Horsepower				Popula- tion, June 1, 1924.	Total Installa- tion Per 1,000 Population.
	In Central Electric Stations	In Pulp and Paper Mills	In Other Industries	Total		
	2	3	4	5	6	7
British Columbia	298,179	54,640	61,883	414,702	553,000	734 h.p.
Alberta	33,520	.....	587	34,107	637,000	54
Saskatchewan .....	.....	.....	35	35	815,000	.04
Manitoba	167,525	.....	16,400	183,925	647,000	284
Ontario	1,502,520	174,548	107,774	1,784,842	3,062,000	578
Quebec	1,399,607	223,144	124,635	1,747,386	2,480,000	703
New Brunswick	23,225	13,003	8,403	44,631	399,400	112
Nova Scotia	31,567	16,636	17,124	65,327	533,000	123
Prince Edward Island	279	.....	1,995	2,274	87,700	26
Yukon and Northwest Territories	10,000	.....	3,199	13,199	12,040	1,096
Canada	3,466,422	481,971	342,035	4,290,428	9,226,740	464

Column 2 includes only hydro-electric stations which develop power for sale.

Column 3 includes only water power *actually developed* by pulp and paper companies. In addition to this total, pulp and paper companies purchase from hydro power central stations totalled in Column 2, power estimated at about 275,000 h.p.

Column 4 includes only water power *actually developed* in connection with industries other than the central station and pulp and paper industries. These industries also purchase blocks of power from the central stations totalled in Column 2.

Column 5 totals all turbines and water wheels installed in Canada.

Column 6 population at June 1st, 1924, as estimated by the Dominion Bureau of Statistics.

*Courtesy, Dominion Water Power and Reclamation Service.

22,550 h.p. minimum and 59,000 h.p. with storage is available. This is the largest water power in the Maritime Provinces (Figs. 28 and 29).

Nova Scotia

Although under conditions of minimum flow Nova Scotia is estimated to have only 20,751 h.p. available, exceptional facilities for storage reservoirs add very materially to the power capable of development. It is only in recent years that surveys and studies of the power resources of the province have brought out this important fact. Installed ca-

capacity at present totals 65,327 h.p. and, with storage possibilities utilized to the full, it is thought that a total installation of 300,000 h.p. will be possible (Fig. 30).

ADMINISTRATION OF WATER POWERS

The foregoing, rapid though the survey has been, will convey some idea of the enormous wealth Canada possesses in her water powers. Naturally, in the alienation and administration of such large assets many difficult problems have had to be solved before principles and policies could be settled upon that would encourage development and at the same

time control selfish and monopolistic tendencies.

Riparian Ownership

In early years, before settlement had penetrated into the country in any volume, and before electrical generation and transmission had reached their present state of efficiency, little attention was paid to the value of water powers; and it was the common practice for property in them to pass according to the common law doctrine of riparian ownership along with the land forming the banks of the streams on which they were situated. Many of the most valuable powers in the older portions of the country passed into private hands in this way. In time, however, the old principle of riparian ownership was modified by legislation, until the usual practice now is for the Crown to part with water-power rights only on long-term leases, carefully safeguarded in respect of efficiency in development and regulation of rates. An outstanding development in several provinces is the establishment by the governments of hydro-electric power commissions to generate and transmit electrical energy.

Dominion Lands

Water powers in Canada on ungranted Crown lands are under the jurisdiction of the Dominion or of the provinces, according to where they are located. In all those provinces which first joined together to form the Canadian confederation they were under the jurisdiction of the provincial parliaments and they so continued after the union. The Dominion government, however, administers water powers in the provinces added later, *viz.*, Manitoba, Saskatchewan, Alberta, the Northwest Territories and Yukon. In the Railway Belt consisting of a strip of territory twenty miles wide on each side of the Canadian Pacific Railway in British Columbia, and a block of land in the northern part of that province known as the Peace River Block, the water powers are owned by the Dominion

but are administered by the Province under the Provincial water acts. The Dominion also administers water powers formed by the construction of canals and public works, and those on Indian lands in certain cases.

Water powers on the public lands of the Dominion are administered by the Minister of the Interior through the Dominion Water Power and Reclamation Service. The Dominion Water Power Act provides that they shall remain vested in the Crown but they may be leased for a period not exceeding fifty years dating from the completion of construction at a rental varying with the load factor. After the first twenty years the rental charge is subject to decennial revision. Provision is also made for control of rates as well as for cancellation of the license to develop power and the recapture of the site after compensation.

Maritime Provinces

In Prince Edward Island, Nova Scotia and New Brunswick, the water powers have practically all passed from the ownership of the Crown with grants of the riparian lands. In the first-named province property in them is still transferred with the adjacent lands, but Nova Scotia in 1919 passed a law re-investing in the province the title to all powers that had previously been granted to private owners, without, however, confiscation of the right of use.

Nova Scotia Power Commission

Legislation was then passed providing for the appointment of the Nova Scotia Power Commission to generate, transmit and distribute power. This commission has begun a programme of power development and distribution along the lines of public ownership, having invested to date about \$2,500,000. Through its offices power is supplied to Halifax, Lunenburg and other parts of the province. Likewise in New Brunswick, development under public ownership is going on through the New Brunswick Electric Power Commission, appointed under

legislation enacted in 1920. This body has expended over \$3,000,000 to date in furtherance of its undertakings.

The Manitoba Power Commission distributes power over 121 miles of transmission lines it has built in the province of Manitoba, and has also begun the generation of electricity on a small scale.

British Columbia

In British Columbia the Minister of Lords administers water powers under the Water Act. Licenses to develop power are issued for a term not exceeding fifty years, except as regards power used for operating a railway in which case they may run for ninety-nine years. Rentals vary from 25 cents to \$2 per developed horsepower, with an additional charge of $2\frac{1}{2}$ cents to 5 cents for undeveloped power.

Quebec

In both Ontario and Quebec, except on navigable and flutable streams water powers were, until recent years, sold with the land adjacent to them, without any special conditions being attached. This practice continued in Quebec till 1897, but after that date special conditions were sometimes imposed, such as requiring the development of a certain horsepower, or expending a certain amount of money in a fixed time. Subsequently, powers were occasionally leased instead of being sold, sometimes with special obligations imposed concerning development, sometimes without. The present policy of the government of Quebec is, generally speaking, to lease water powers on a long-term emphyteutic lease, usually for 75 years, the rental charge being revisable decennially. Administration is vested in the Hydraulic Service of the Department of Lands and Forests.

The Quebec Streams Commission

The government of Quebec, in harmony with the traditions of that province, in encouraging individual initiative, has engaged in no public ownership projects for the development and transmission of electrical energy generated

from water power. It has, however, through the instrumentality of the Quebec Streams Commission, very materially assisted development on the part of private interests by carrying on research work and surveys and by building immense storage reservoirs to increase and regulate the power available on the rivers of the province. The cost of these is assessed against the power companies benefited.

The Gouin Dam

The most important reservoir operated by the commission is on the St. Maurice river, where the Gouin dam, with a storage capacity of 160,000,000,000 cubic feet of water, more than doubles the power possibilities of the river. It is the largest storage reservoir in the world built for power purposes. The Allard dam on the St. François river stores 12,000,000,000 cubic feet and adds some 40,000 h.p. to the power possibilities of the river. Two reservoirs on the Ste. Anne de Beaupre river considerably increase its dependable flow. The most recent works of the Commission have been a 13,000,000,000-cubic feet reservoir on Lake Kenogami, near Chicoutimi, and one of 2,198,000,000 cu. ft. on the Metis river. Several other sites are being studied with a view to future undertakings of a similar kind.

Ontario

In 1898 the Ontario government adopted the policy of leasing water powers on Crown lands for a twenty-year period, the leases being renewable for two further periods of ten years each, at a nominal fee for the first two years and an annual rental charge, usually 50 cents, on each horsepower produced thereafter. The Department of Lands, Forests and Mines and the Hydro-Electric Power Commission of Ontario, established in 1906, are in charge of the administration of water powers (Fig. 31).

SUPER-POWER SYSTEMS

The Power Movement in Ontario

The Hydro-Electric Power Commission dominates the water power situation

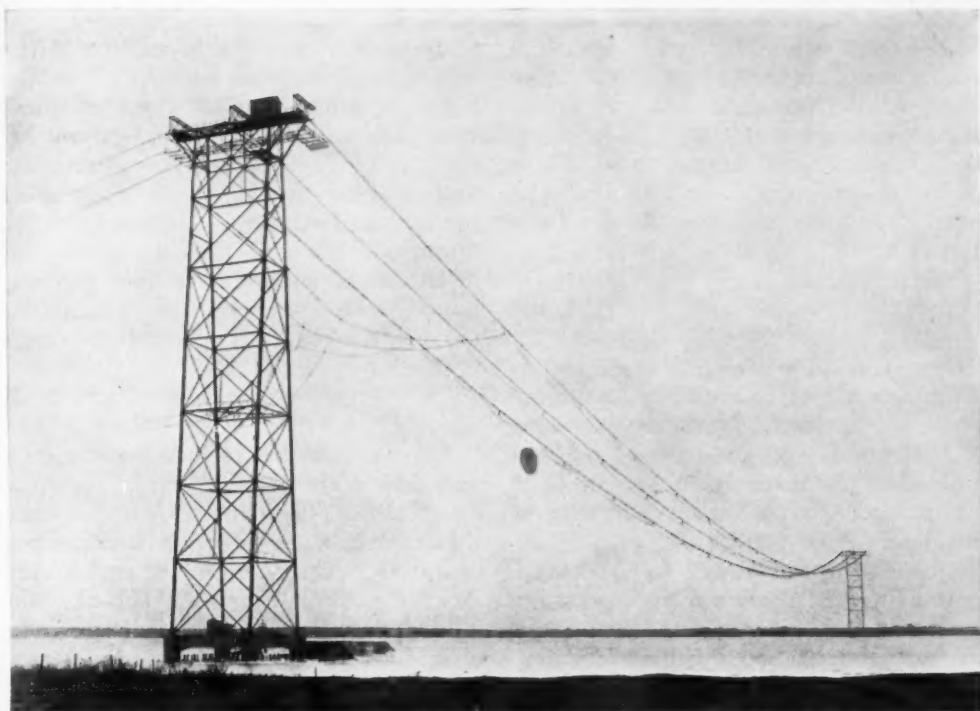


FIGURE 31.—The largest span of high tension transmission line crossing the St. Lawrence River in the province of Quebec. (Courtesy of Commission of Conservation.)

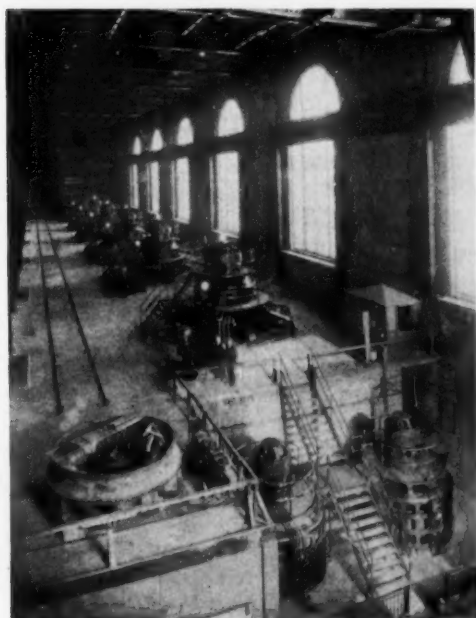


FIGURE 32.—The Generator Room of the World's Largest Hydro-Electric Power Plant, Queenston, Ontario, one of the many proud achievements of the electrical engineering wizards. (Courtesy of Hydro-Electric Power Commission of Ontario.)

in Ontario and as the largest publicly owned and operated power system in existence it merits some attention. The "power movement" in Ontario began in the early years of the present century, due to the fact that the province was without coal resources and its whole industrial life was at the mercy of coal strikes and transportation tie-ups in the United States. The prolonged coal strike of 1903 was the immediate incident which brought to fruition the movement among the municipalities of southwestern Ontario to secure a publicly owned power system utilizing the water-power energy of Niagara falls. The system beginning as a transmission undertaking with a load of 1,000 h.p. in 1910, now embraces the whole province. Its nine subsidiary systems, many of which are interconnected, constitute what has come to be called in the United States a 'giant' or 'superpower' organization. It distributes at the present time about 800,000 h.p. and operates water-power instal-

lations which, when fully developed, will have a potentiality of over 1,000,000 h.p. Its transmission lines exceed 4,000 miles in length. Over 520 miles of these transmit energy at 110,000 volts pressure, the greatest continuous length of this high-pressure voltage covering a span of nearly 250 miles between Niagara Falls and Windsor (Fig. 32).

The World's Largest Hydro-Electric Development

The Commission's new Queenston-Chippawa development is the largest single hydro-electric power development in the world. Its capacity is 600,000 h.p., made up of ten generating units of 60,000 h.p. each, nine of which have been installed. Every utilizable foot, 305 feet out of a total fall of 327 feet, between Lake Erie and Lake Ontario is used, with the result that every cubic foot of water per second that flows through the immense concrete-lined canal develops 30 h.p., as compared with 16 h.p. at the most efficient of the old plants located at the falls themselves.

The "Hydro" system, as it is familiarly called in Ontario, serves over 380 municipalities and many large industrial concerns, including practically all of the large cities, towns and villages of the province, together with numerous rural municipalities. This achievement, representing an investment of over \$262,000,000, and accomplished in fifteen years despite the strenuous opposition of corporate interests, is a monument to the public spirit and indomitable energy of Sir Adam Beck, lately deceased, who was its chief promoter and head.

A Partnership of Municipalities

Fundamentally it is a partnership of municipalities formed to obtain power at cost, each municipality paying its proportionate share. The Commission, which is appointed by the Ontario government, acts in the capacity of a trustee for these partners. Capital for the generation and transmission plant is loaned by the government, and contracts are made

with the municipalities whereby they undertake to repay over a period of thirty years the moneys so advanced. Power rates are adjusted by the Commission so that they will cover this obligation, including interest, depreciation, renewals and sinking fund. The Commission merely delivers power to the partner municipalities, and they undertake to distribute it within their own borders, issuing their own municipal debentures to cover the cost of the local distribution systems.

Low-Cost Power

Rates are subject to the Commission's approval. That the "Hydro" provides cheap power is evidenced by a glance at the rate schedules showing the average charges for power and light in each municipality. For example, Toronto, 90 miles distant from Niagara Falls, pays for residence service 1.93 cents per kilowatt-hour, for commercial service 2.6 cents and for power service, \$28.37 per horsepower-year. In Hamilton, 50 miles from Niagara, the corresponding rates are 1.73 cents, 1.48 cents and \$14.93 respectively, while in Galt, with a population of 13,000, located 93 miles from the falls, they are 1.56 cents, 2.04 cents and \$21.57, respectively.

Giant Power in Quebec

In Quebec private ownership holds sway. The giant system there, corresponding in magnitude to the Hydro-Electric Power system in Ontario, is that of the Shawinigan Water and Power Company, the controlling interest in which is allied with that of the Montreal Light, Heat and Power Company. Most of its power is generated on the St. Maurice river at Shawinigan falls, Grand Mère and La Gabelle, where large industrial communities have been built up. The Shawinigan system has an installed capacity for developing 570,800 h.p. Its distribution system serves 160 municipalities, covering a triangular area of over 15,000 square miles and extends from below Quebec city on the north, to

slightly beyond Montreal on the south, and to Sherbrooke in the Eastern Townships on the east. In a sense it, also, can be said to be a product of public ownership, for among its 7,700 shareholders every municipality it serves is represented.

EXPORT OF POWER

Where there is so much water power available in a country sparsely populated, while immediately to the south lies a highly industrialized, populous neighbor, the question of whether export of power should be permitted naturally arises. In 1925 Canada exported to the United States electrical energy equivalent to 189,576 h.p.-years. The most of this was developed either at Niagara falls or at the Cedars, near Montreal, from whence it is transmitted to the Aluminum Company of America at Massena, N. Y.

No power may be exported except under a revocable federal permit, and in 1925 an export duty of three one-hundredths of a cent per kilowatt-hour was imposed. Public sentiment is strongly in favor of retaining Canadian power at home to build up Canadian industry. It is felt that if industries in a foreign country are built up with Canadian power, it will be impossible, without serious international complications, to withdraw that power when it is required in Canada. The Dominion House of Commons in 1925 placed itself on record as opposed to the export of power, except under revocable annual licenses. Premier Taschereau of Quebec has taken an emphatic stand against export, and in the leases covering the large developments of power on the Saguenay river clauses have been inserted prohibiting export. Furthermore, the Quebec government has announced that in future leases the export from another province of power originating in Quebec will act to cancel the lease.

From this it is evident that the economic importance to Canada of her water-power resources is becoming fully appreciated. Installations have in-

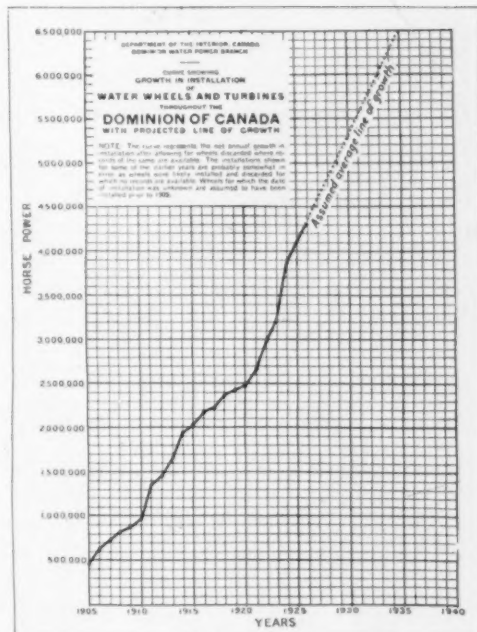


FIGURE 33.—A chart that speaks eloquently of Canada's developed water power and indicates the progress of her people toward industrialism and a substantial prosperity. (Courtesy of the Dominion Water Power and Reclamation Service, Canada.)

creased from 975,000 h.p. in 1910 to 4,290,428 h.p. at the end of 1925, and the capital investment in water-power developments is estimated at \$815,723,890 (Fig. 33). The most striking developments have been in the supply of power through such large super-power projects as the Hydro-Electric system in Ontario and the Shawinigan system in Quebec, and in the development of the pulp and paper industry. Since approximately 100 h.p. is required in the manufacture of a ton of newsprint, the occurrence of cheap and plentiful supplies of power in the extensive pulpwood areas of British Columbia, and those comprising the Laurentian area of Ontario, Quebec and Manitoba have been of the very first importance to the paper industry. Pre-eminence in this industry in North America has shifted to Canada, and striking expansion is likely in the next decade. The Laurentian area, as yet scarcely prospected at all, is rich in minerals, as witness the recent gold dis-



FIGURE 34.—Hydro-electric power development and pulp and paper plant of Pacific Mills, Ltd., at Ocean Falls, on the Link River, British Columbia, where the utilization of pulpwood and water power, native resources, has created a frontier center of activity and prosperity; a convincing bit of interplay of geographic factors. (Courtesy of Pacific Mills, Ltd.)

coveries of the Rouyn district of Quebec, the gold and silver areas of Cobalt and Porcupine in Ontario and the Flin Flon gold-copper deposits in Manitoba. Water power in these remote regions where the use of coal would be so expensive as to be prohibitive, is of outstanding economic importance. Using the conservative figure of nine tons of coal as equivalent to one horse-power-year, and valuing coal at \$10 per ton, the present water-power installations in Canada are equivalent to over \$385,000,000 worth of coal per annum, which would otherwise have to be imported and paid for.

As population grows, water power will be used to an increasing extent in railway electrification, especially on mountain grades and where density of traffic is great. In the chemical industries the application of water power is almost limitless. Already at Niagara and at

Three Rivers hydro-electric energy is being utilized in such industries; and, in a predominantly agricultural country like Canada, the demand for nitrogenous fertilizers electrically produced will grow as the fertility of virgin lands becomes exhausted.

And finally, in estimating the economic value of Canadian water powers, the value which location on tide-water adds to the energy produced by the great water-power zones adjacent to the St. Lawrence waterway and the Pacific coast, must not be left out of account; for low-cost production is a vital factor in competing for foreign markets. In summing up the case it becomes clear that, while in some portions of her wide domain Canada lacks in coal deposits, the deficiency has been more than atoned for in the white coal of her generous water-power heritage (Fig. 34).

THE AGRICULTURE OF THE EASTERN SHORE COUNTRY

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THE portion of the state of Maryland long known as "The Eastern Shore," lies directly east of Chesapeake Bay. Together with almost the whole of the state of Delaware and a very slight part of Virginia, it forms the peninsula which has for its eastern boundaries the Atlantic Ocean and Delaware Bay (Fig. 1). Of the six thousand square miles that make up the area of the peninsula, Virginia contributes about one-tenth, Delaware one-third, and Maryland something more than one-half of the total. Possibly because of dominance in the matter of land area (though the suggestion is hardly susceptible of proof), the name popularly given to Eastern Maryland has been extended of recent years, and is now applied to the whole of the peninsula. It is in this wider sense that we shall use the term "The Eastern Shore Country" in our examination into the economic activities of the Delaware-Maryland-Virginia Peninsula.

THE PHYSIOGRAPHIC HISTORY

The Eastern Shore Country is a part of the Atlantic Coastal Plain, that great strip of lowland which was once a part of the sea floor, having been made up of material eroded from inland areas and washed down to the sea. The Coastal Plain is a more or less dissected plain, seldom more than two hundred or three hundred feet above sea level; and its soils are mainly sands, light sandy loams, and loose gravels, with occasional deposits of silts and heavy clays.

This general description of the Coastal Plain is applicable to The Eastern Shore Country, but we may inquire a little more closely into the physical makeup of the smaller region. In area the peninsula is about equal to a block of

land some seventy-eight miles square. But its shape has nothing of geometrical regularity. While the peninsula was yet submerged, the swollen Susquehanna and Delaware brought down their burden of eroded matter mingled with glacial material, and built up the long, comparatively narrow outline of the peninsula. The surface is level or gently rolling, the greater part having an elevation of less than twenty-five feet. Most of it is varied sufficiently to insure natural drainage, but in some cases the soil must be drained artificially before cultivation is possible. Enough time has elapsed since its formation to permit the surface to be worked upon by natural forces. Thus we find that creeks and rivers have cut their way through the loose, sandy soil; whilst the waters bordering the peninsula have made marked inroads upon the shore line, severing tiny islands from the mainland, and forming the small bays and inlets that play an important part in connection with the fisheries of the Chesapeake.

THE SOILS

The leading industry of The Eastern Shore is agriculture, the success of which turns, of course, upon such matters as soil conditions, distribution of rainfall, and length of growing season. As we have already noted, the soil is not uniform in character, but varies from stiff, heavy clay to a sandy soil which can be worked readily, and from which proper methods of cultivation bring good returns. In a general way the soil becomes more sandy as the southern portion of the peninsula is approached. The northern part has many large, level tracts of loam which overlie clay loam subsoils, producing good crops of wheat and corn. Farther south are areas of

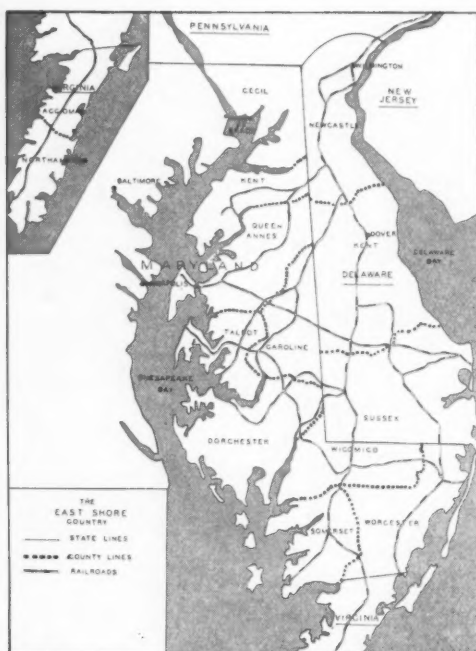


FIGURE 1.—“The Eastern Shore Country” comprises Maryland east of Chesapeake Bay, the whole of Delaware, and a tiny bit of Virginia at the end of the peninsula.

stiff, clayey soil, much of which requires underdrainage to make it productive. In the sections still farther south, and particularly in the two counties of Virginia which form the tip of the peninsula, the soil is made up largely of sandy loams, with red clay subsoil, especially suited to the growing of vegetables and small fruits. The soil of the west coast is heavier than that of the central por-

tion, and is better adapted for pasture land. We have made no attempt at hard and fast classification of these soils, for such classification is not possible. Though there is a marked tendency toward a greater amount of sandy soil in the south, soil of this kind may also be found well north, whilst red and yellow clays are by no means confined to the upper peninsula.

The soils of The Eastern Shore are not rich in natural fertility. Some of them are, indeed, notably deficient in plant food, and require careful treatment if they are to yield abundantly. Green manuring is effective in the “building up” process: Cow peas, soy beans (Fig. 2), and crimson clover are plowed under and render the soil remarkably productive. Liming is necessary in some cases; and the liberal application of good commercial fertilizers brings large returns.

CLIMATE

So far as climatic conditions are concerned, the farmers of The Eastern Shore are highly favored. The Chesapeake on the one hand, and Delaware Bay and the ocean on the other, insure that moderation of temperature which goes with nearness to great bodies of water. The tempering influence is felt for perhaps ten miles inland, and the peninsular form of The Eastern Shore Country permits this advantage to be realized from two sides instead of from



FIGURE 2.—A field of soy beans. Soy beans form one of the “green manures” effective in building up the fertility of the Eastern shore soils, naturally deficient in plant food. (Courtesy of G. R. Cobb.)

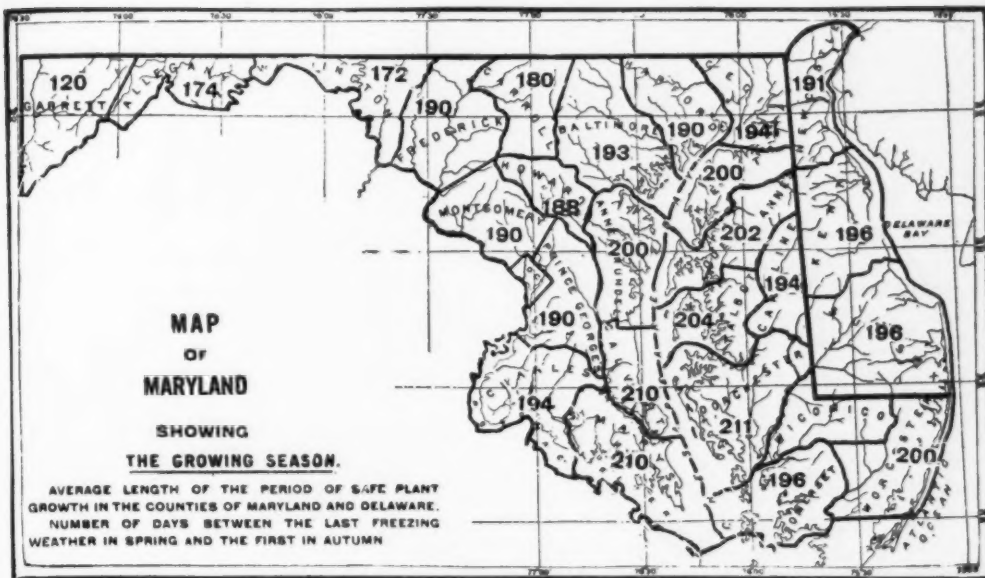


FIGURE 3.—The long growing season of the Eastern Shore country is a decided advantage to the truck-growers of the Eastern Shore country. Winter is everywhere rather mild and nowhere very long.

one only. Contributing to the same end is the sandiness of the soil, for sand possesses the faculty of storing up heat in the day time and radiating it slowly at night. In this way evenness of temperature is maintained and danger from frost is lessened. The combination of sandy soil and moderate climate means an *early* season, the possibility of marketing vegetables two or three weeks before the truck farmers farther north and those of the inland are ready to compete, and a consequent higher price for the product. It means, further, a *long* growing season; and this, again, is an item which may be converted into hard cash through the medium of intensive cultivation (Fig. 3). The Maryland Weather Service, basing its statement on observations of twenty years, announces a safe growing season of 190 to 210 days in the Delaware-Maryland-Virginia Peninsula. In a frost-free season of such length, several vegetable crops may be produced on a given piece of ground. This fact will have greater significance for the future than it holds at present; for the pressure on trucking land is not yet great enough to make such intensive culture necessary.

In the matter of rainfall, also, The Eastern Shore is well situated. The minimum precipitation with which ordinary agriculture can be carried on in this latitude without recourse to artificial irrigation is twenty inches. Thirty inches are more satisfactory, and a total of forty inches for the year is still better (Fig. 4). The average rainfall in The Eastern Shore Country is from forty to forty-five inches. This is none too much, since a good deal of the soil is loose and sandy and does not retain the moisture well. However, the rainfall is well distributed throughout the growing season, and crops do not suffer from lack of moisture.

AGRICULTURE THE DOMINANT INDUSTRY

Agriculture in the peninsula takes various forms, and includes the growing of staple crops, dairying, and the incidental raising of sheep, hogs and poultry, fruit culture, and the specialized production of vast quantities of vegetables and small fruits. Of the cereal crops, corn and wheat alone are of importance. About one million acres (or one-fourth of the area of the peninsula) are allotted

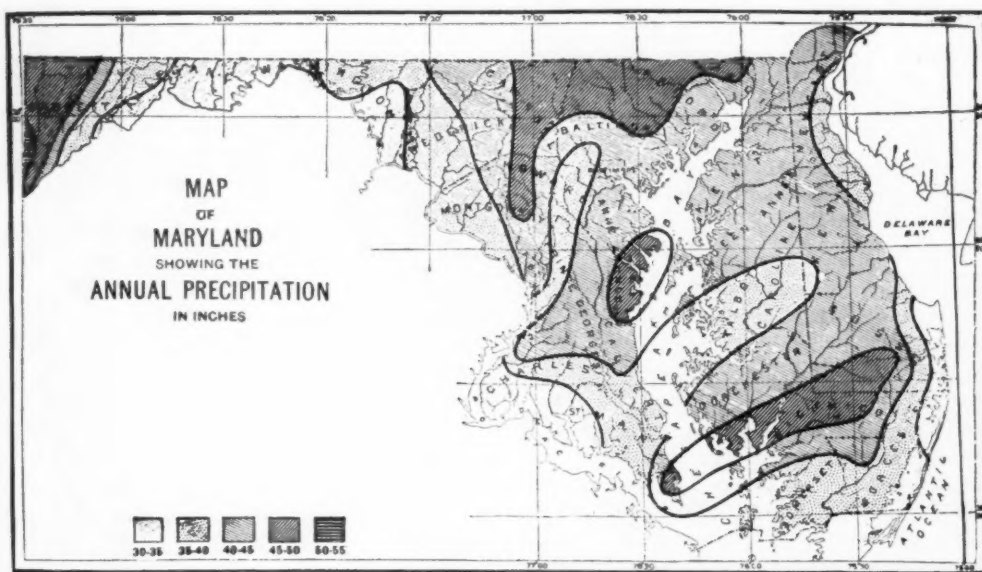


FIGURE 4.—The copious, but not excessive rainfall rather well distributed throughout the growing season, counterbalances the disadvantage of a loose sandy soil that will not retain moisture well.

to these two grains, corn having a somewhat greater acreage than wheat. Practically all of the wheat is grown in the northern half of the peninsula, and particularly along Chesapeake Bay; but corn has a much wider distribution, extending from the Pennsylvania borderline to the farthest point in Virginia. Oats and buckwheat are produced in relatively small quantities, oats being important only in the extreme north, whilst buckwheat claims some recognition in Sussex County, the southernmost county of Delaware. So far as yield is concerned, corn heads the list of these cereals, producing twenty-four bushels to the acre, which is the average yield for the United States (Fig. 5). Wheat falls a trifle below the national average, and oats and buckwheat just about hold their own. Grain crops are not gaining ground rapidly in The Eastern Shore. Figures of today, compared with those of ten years ago, show an increase of about 100,000 acres in the area devoted to cereals, and there is little reason to look for great future expansion along these lines. The land here may on the whole be used to better advantage in other branches of agriculture.

Hay and Dairy

A large quantity of hay is grown in The Eastern Shore Country, but it is used mainly for local consumption. The areas producing hay are likewise those most important in dairying and stock-raising. The northern part of the peninsula is the hay region, and here, also, are three-fourths of the dairy cattle and virtually all the beef cattle. The conditions which enable Cecil County, Maryland, and the three counties of Delaware to raise most of the hay of the peninsula, also provide the grazing land for a good part of The Eastern Shore's beef cattle; though Worcester County, Maryland, heads the list in the production of beef. The leading dairying sections are those counties well north (and therefore near the markets of Wilmington and Philadelphia), and the counties bordering the Chesapeake, which possess a soil especially favorable for pasturage, as we have already noted (Fig. 6). The value of dairy products has gained enormously since the 1910 census, but the number of dairy cows remains about the same, so that the gains are due to increased prices, and perhaps to some



FIGURE 5.—After application of barn-yard manure and cropping with clover, the Eastern Shore yields well in corn, and over half a million acres are planted to this crop. (Courtesy of G. R. Cobb.)

extent to the fact that the quality of the herds is improving. The income from this source was approximately five million dollars in 1919, a small item, of course, when compared with the tremendous returns from dairying in New York and Wisconsin.

Cattle-grazing is of little importance here; it is, rather, an incidental branch of farming, as is also the raising of sheep, hogs, and poultry. Many Eastern Shore farmers, in addition to the growing of a major crop (which may be grains, fruits, or vegetables), keep a few domestic animals as a sort of side line. Thus we find that the production of swine is pretty evenly distributed throughout the peninsula. Poultry-raising is also car-

ried on over a wide area, though Sussex County, Delaware, easily takes the lead in the production of poultry and poultry products (Fig. 7). A greater degree of concentration is evident in the case of sheep, which are important only in Kent, Queen Anne's, and Talbot Counties, that strip of particularly good grazing land found along Chesapeake Bay. Of these three so-called incidental branches of agriculture, poultry-raising is by all odds the most important. The returns from this source total something more than seven million dollars annually. The income from the sale of hogs is two million dollars a year; whilst beef cattle and sheep bring in another million dollars, which is divided almost equally between the two.

Orchard Fruits

Turning now to the consideration of orchard fruits, we find that this phase of agriculture is centered largely in four counties in the northern part of the peninsula: New Castle and Kent Counties, Delaware, and the two counties of Maryland directly to the west, namely Kent and Queen Anne's. This centralization is not so evident in the case of apples, the most productive fruit crop, for apple culture is carried on to a limited extent in practically every county. Yet these four counties produced more than one-half of the total apple output of the peninsula in 1919, the whole of which was valued at one and a half million dollars. The peach crop of that year sold for a trifle less than a million dollars, and one-third of this amount should be credited to the counties named. Two-thirds of the pears are also produced in this small area. The pear crop is worth about eight hundred thousand dollars. We should note, in connection with our survey of orchard fruits, that Delaware was at one time the most important peach-growing center in the world. In 1875, the state produced some eight hundred thousand bushels of peaches, a record which had never been reached up to that time (Fig. 8). Since then,



FIGURE 6.—Cattle thrive well in the northern part of the peninsula and near the Wilmington and Philadelphia markets dairying has become an important industry. (Courtesy of G. R. Cobb.)

there has been a marked decline in peach production in Delaware, due largely to the prevalence of frosts. The early spring of the peninsula, so desirable in many ways, induces hasty budding of the peach trees, with the result that the buds are sometimes caught and destroyed by a late frost. Indeed, frost has reduced the average number of peach crops to about three in five years. The uncer-

tainty of the crop had, for many years, a disastrous effect on peach production and on the planting of new orchards. But orchardists are regaining their confidence in the possibility of profitable peach culture, and the production curve is again rising, though the output is today only half as great as fifty years ago. The apple, leader among the orchard fruits, is forging ahead steadily. The

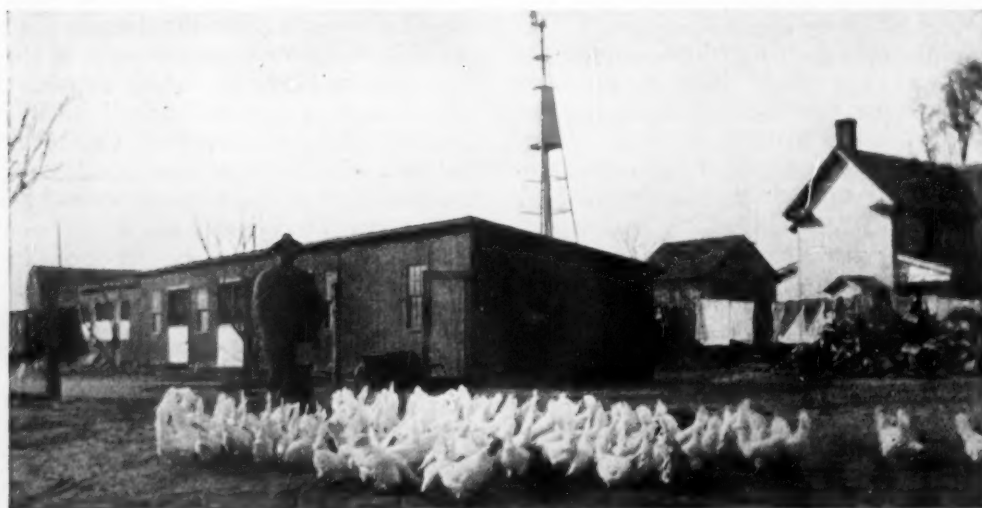


FIGURE 7.—Poultry-raising is extensively developed, but Sussex County, Delaware takes the lead in production of poultry products. (Courtesy of G. R. Cobb.)



FIGURE 8.—A twenty-year-old peach orchard on the Eastern Shore, still bearing well. In 1875, Maryland was the banner peach-growing state, but though the industry is still important it has lost its preëminence. (Courtesy of G. R. Cobb.)

yield of 1910 was doubled in 1919, when The Eastern Shore produced eight hundred thousand bushels of apples.

Truck

Thus far we have had little to say of agriculture in the southern part of the peninsula, since the products already discussed are raised more satisfactorily

farther north. We shall now look into the growing of vegetables and small fruits, a subject which takes us to the warm, light, sandy soil of the south, where these products are decidedly in their element. From Sussex County, Delaware, a "potato belt" stretches down to the very end of the peninsula, and though both white and sweet pota-



FIGURE 9.—Wagons awaiting the arrival of potato-pickers who invade the tip of the Peninsula for the potato harvest labor. (Courtesy of Pennsylvania Railroad System.)



FIGURE 10.—Potatoes being loaded on the waiting freight cars, by which they are carried promptly to the early markets northward. (Courtesy of Pennsylvania Railroad System.)

atoes may be found elsewhere in The Eastern Shore, it is within this belt that they grow most abundantly (Figs. 9 and 10). The two counties of Virginia are easily the leaders in the production of white potatoes (Fig. 11), utilizing together about fifty thousand acres of land for this purpose, and producing

seven and one-half million bushels in 1919. Sussex County, Delaware, and Accomac County, Virginia, head the list in the output of sweet potatoes. The latter is the foremost sweet potato county in the United States, growing fully five per cent of the nation's total (Fig. 12). Of the Eastern Shore's production of



FIGURE 11.—The two Virginia counties of the Eastern Shore country are easily the leaders in the production of early Irish Potatoes. Fifty thousand acres in these two counties are devoted to potatoes. (Courtesy of G. R. Cobb.)



FIGURE 12.—Five per cent of the nation's total of sweet potatoes are grown in Accomac County, Virginia. Sussex County, Maryland and Accomac County, Virginia, produce $4\frac{1}{2}$ million bushels. (Courtesy of G. R. Cobb.)

sweet potatoes, Sussex and Accomac Counties produce four and one-half million bushels, or more than one-half of the total for the peninsula, on some twenty-five thousand acres of land.

Corn, peas, cabbage, onions, lettuce, asparagus, and tomatoes are grown in large quantities here in the truck gardens of The Eastern Shore (Fig. 13). Some of these vegetables have a wide distribution, and many acres of tomatoes in particular are raised in every county. A few of these are sold as they ripen, but by far the greater part of the tomato crop is sold to the canneries that dot the

vegetable-growing sections (Fig. 14). Corn and peas, also, are grown largely for canning, and when this is the case may be found fairly well north. However, the chief aim of the truck-farmer who supplies the green-grocer, is to get his vegetables to market "ahead of the season." Hence he is likely to locate in the lower end of the peninsula; and here is grown much of the truck that commands fancy prices in the early market.

This, too, is the land of watermelons, cantaloupes, strawberries, blackberries, raspberries, and other small fruits. Sussex County, Delaware, has large



FIGURE 13.—The cabbage crop is a good money crop for the farmers of the Eastern Shore country. (Courtesy of G. R. Cobb.)



FIGURE 14.—Tomatoes grown on the Eastern Shore farms are almost all utilized by the canneries. Only a few are sold as they ripen. (Courtesy of G. R. Cobb.)

yields of these fruits, and clearly ranks first in the growing of strawberries (Fig. 15). The output of this county alone was three and one-half million quarts of strawberries in 1919, whilst in 1910 the yield was several times this quantity. The entire peninsula produced nearly thirteen million quarts of this fruit in 1919. Bridgeville, a small town in Sussex County, is the greatest shipping point for strawberries in the world, sending out in some seasons as many as five hundred refrigerator cars of the fruit (Fig. 16). Sussex County is also a center for blackberries and dewberries, but most of the raspberries are raised in Kent County, Delaware, di-

rectly to the north, and in Wicomico County, Maryland, directly to the south. Thousands of acres are given over to watermelons and cantaloupes in Delaware and the lower peninsula (Fig. 17).

A word may here be said of the importance of truck in relation to the other crops of The Eastern Shore. The census of 1919 shows that, at that time, the income from vegetables, including white and sweet potatoes, amounted to more than forty million dollars. Two hundred and fifty thousand acres were devoted to vegetable culture, as against nine hundred thousand used for the production of cereal crops. Truck-rais-



FIGURE 15.—Sussex County, Delaware, easily ranks first in the growing of strawberries. The light soils, the favorable climate, and the excellent nearby markets combine to form almost ideal conditions for the industry. (Courtesy of G. R. Cobb.)



FIGURE 16.—The Eastern Shore country produced 13 million quarts of strawberries in 1919. In the picking season thousands of women and children come out from the cities to help in the harvest. (Courtesy of G. R. Cobb.)

ing is therefore an extremely important item in the agriculture of the peninsula. Moreover, there is an unmistakable tendency to increase the acreage utilized for trucking purposes, and we may well look for rapid expansion now that the industry here has got beyond the experimental stage. There is abundant proof of the ability of The Eastern Shore to produce truck and small fruits of the finest grade, to produce them early in the season, and with large yield per acre. With the greater demand for vegetables that will follow upon increasing population, large areas of the peninsula now used for staple crops will almost cer-

tainly be turned over eventually to intensive truck-farming.

THE MATTER OF MARKETS

Two points must not be overlooked in the development of a great trucking center. In addition to the natural conditions essential to the actual growing of produce, a ready market and good transportation are necessary. The chief markets for Eastern Shore truck, sold in the raw state, are Baltimore, Washington, Philadelphia, and New York. When we remember that the extreme lower end of Delaware is nearer New York City than is half the state of New York, we

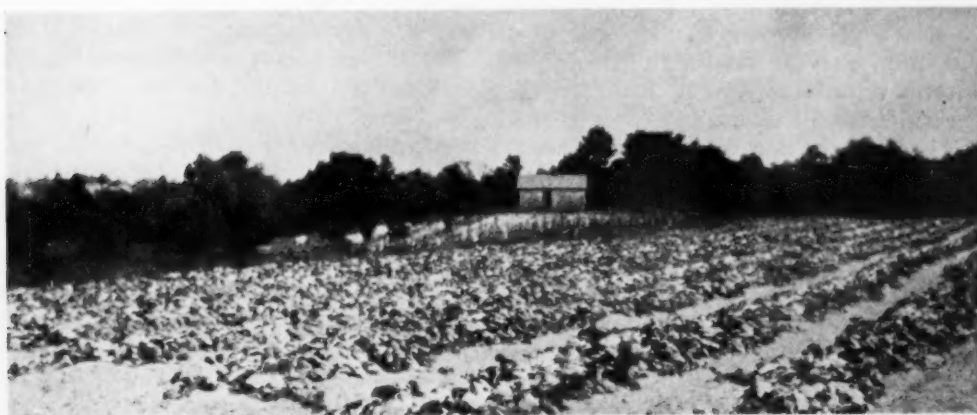


FIGURE 17.—Thousands of acres of the Eastern Shore country are given over to cantaloupes, a profitable crop when the market is not glutted by the product from farther south. (Courtesy of G. R. Cobb.)



FIGURE 18.—In fruit and truck season, expresses are run every morning on regular schedules to the metropolitan centers nearby. The perishable crops are transported in iced cars. (Courtesy of Pennsylvania Railroad System.)

can scarcely wonder that the truck-farmer of The Eastern Shore aspires to supply a part of the vegetable needs of the metropolis. Aside from the four great cities already mentioned, which are within two hundred miles of the peninsula, there is a host of smaller cities and towns equally near—such towns as Wilmington, Chester, York, Harrisburg, Lancaster and Trenton, comparatively small when considered individually, but capable in the aggregate of consuming vast quantities of vegetables and fruits.

The Eastern Shore farmer cannot hope, of course, to capture the entire market afforded by the nearness of densely populated districts. He meets with competition from all sides, and competition of the sharpest kind. New York City has the Long Island truck farms right at hand; Philadelphia, the productive fields of south Jersey; and Baltimore and Washington are supplied in large part from the trucking region around Norfolk. But The Eastern

Shore need not give way to any of these great trucking centers. It holds, in several ways, a strategic position. Its planting season is about the same as that of Norfolk, and it has the "jump" on New Jersey and Long Island by about two weeks. Here, then, is a brief period when it may rightly expect to supply Philadelphia and New York with early vegetables. In like manner, toward the close of the growing season, The Eastern Shore truck farms are productive two weeks after the frosts have killed plant life in Jersey and Long Island, and "eleventh hour" truck brings high prices.

In the matter of reaching the markets, no real difficulties are presented. The lacework of bays and rivers in the Maryland portion of the peninsula furnishes navigation to towns situated far inland, and Washington and Baltimore may be reached readily by water routes. A glance at the map shows the possibilities of rail transportation. No part of The Eastern Shore is as far remote as ten miles from a railway line, and most of it is within half that distance. Fast freight trains leave every morning, connecting all points with Baltimore, Philadelphia, and New York. In fruit and truck season, expresses are run every morning on regular schedules (Fig. 18). For extremely perishable commodities, the distance to New York, for instance, may be too great, though the use of refrigerator cars makes possible the shipment of such goods. For the ordinary run of vegetables, the transportation facilities are ample.

LOW COST OF LAND

A final point in favor of The Eastern Shore is the small cost of farm land, with a consequently low interest charge. Excellent trucking land may be had in the Virginia counties (where cultivation is most intensive) for one hundred and fifty dollars an acre; on Long Island the average is about fifteen hundred dollars. Here, at the very outset, is a burden on the Long Island farmer of ninety dollars an acre which must be paid in interest

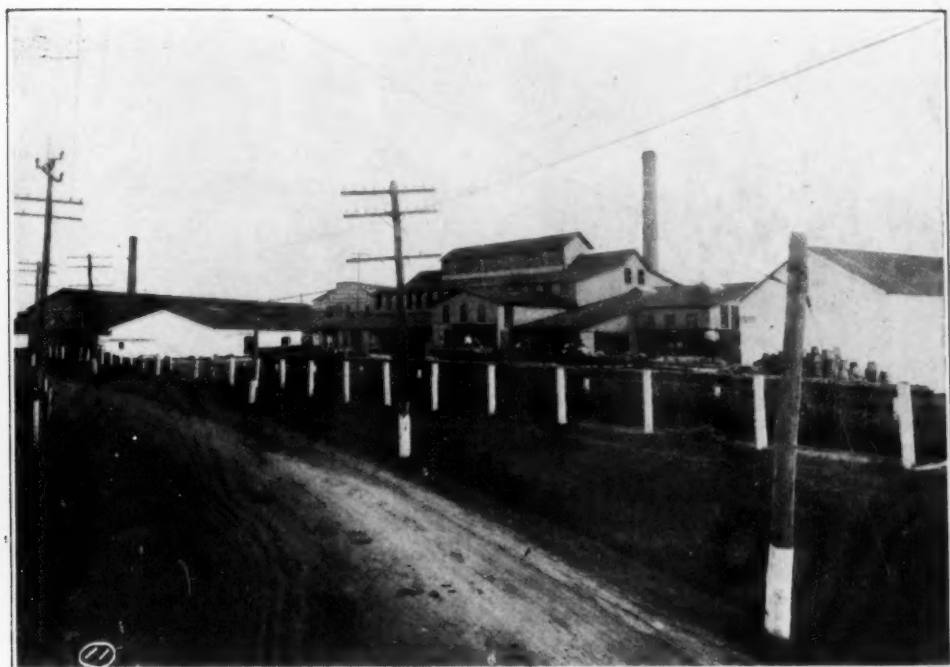


FIGURE 19.—In the marketing of the fruit and truck produce of the Eastern Shore country, the coöperative plants are playing an ever increasing part. (Courtesy of Chamber of Commerce, Cambridge, Md.)

out of his receipts. The interest charge of the Eastern Shore trucker is one-tenth as great. It will be seen, therefore, that the truck farmer of the peninsula, despite his greater distance from certain markets, is not so badly located after all.

COÖPERATIVE ASSOCIATIONS

In The Eastern Shore, as in most regions where specialized agriculture is practiced on a large scale, considerable attention has been given to the question of producers' associations (Fig. 19). These coöperative organizations are of particular importance in connection with marketing, and those sections of the peninsula which have such associations frequently receive far larger returns per unit of product than do other regions, and also avoid shipping truck to marketing centers which are already overstocked (Fig. 20). There is in The Eastern Shore room for much wider organization of the farmers, and development along this line will doubtless

take place with the increasing utilization of land for trucking purposes.

MANUFACTURING

The peninsula is not in any true sense a manufacturing country. The wealth of The Eastern Shore (apart from that derived from the fishing industry, which will not be discussed in the present paper) is dependent almost wholly upon its agricultural activities. Eighty per cent of the total area is laid out in farms, and this proportion is likely to increase rather than to diminish.

To the north lies the city of Wilmington, which is important in an industrial way; but Wilmington is not a part of The Eastern Shore Country, and its rise in manufacturing is due to conditions which do not exist in the peninsula. Clearly, nature never intended this low, sandy country for manufacturing. It has no water power, and is wholly lacking in coal and other mineral wealth so essential to industrial development.



FIGURE 20.—Far larger returns per unit of product, more frequent and ample profits, and a community of life and industrial interests results from the coöperative associations into which the farmers are banded together. (Courtesy of G. R. Cobb.)

Cities and large towns, which are ordinarily an indication of industrial or commercial growth, are not to be found here. The largest centers of population are Crisfield, Salisbury, and Cambridge, and none of these towns exceeds ten thousand in population. Salisbury is important chiefly as a distributing point; Cambridge and Crisfield have grown up with the fishing industry.

Diminishing Timber Resources

The Eastern Shore was originally covered with a heavy growth of timber. Oak, chestnut, pine, beech, and cypress were once plentiful. Oak and pine were the most abundant and most valuable, but these varieties are disappearing rapidly. White oak has been in great demand for ship-building. In the exploitation of these lumber resources, saw mills have sprung up throughout the peninsula, and many are still in operation. Most of these mills, however, aim only to serve the needs of the local communities. And at best their owners are playing a game which must end in a few years; for the Delaware-Maryland-Virginia Peninsula is not true forestry

land. It is simply being cleared for agricultural use, and with the passing of the forests the lumber and saw mills must go out of existence.

Manufactured Farm Products

Of greater permanence are those industries that depend on one branch or another of agriculture. Such industries are represented by creameries and canneries, which are linked up with dairying and truck-farming, respectively. Dairying is not practiced widely enough to create a large number of creameries, and to this statement must be added the fact that much of the milk is sold in the raw state. Canning, however, is on a different basis, and is an industry of far greater dimensions.

Canneries have often had their beginnings in the inability of a market to consume the entire output of a perishable product. For this reason, we find canneries located in practically every community that makes pretense to being a fruit- or vegetable-growing center. Experience has taught the producers that years of glut or over-production are bound to occur. To guard against the



FIGURE 21.—The number of sheep grazed in the Eastern Shore country is constantly diminishing. As the truck and fruit industry progresses the pastoral phase of the farm life vanishes. (Courtesy of Chamber of Commerce, Cambridge, Md.)

evils of such "fat years," canneries are established to turn the surplus crop into canned goods. These goods may not yield a large profit; nevertheless, they bring a fair return to the producer of the raw product, by whom the canneries are generally financed.

But the demand for canned fruits and vegetables has made such tremendous strides of late years, that comparatively few canneries exist wholly (or, indeed, chiefly) to handle the surplus crop. In addition to the activities of fruit-growers' associations (which frequently operate canning-houses where defective or undersized apples and peaches may be turned into marmalade or jelly), there is a large field occupied by professional canners, to whom canning is not a side line but a business of first importance. Contracting often a year ahead for total crops of tomatoes, peas, or sweet corn, these canners put up annually millions of cases of tinned vegetables, which eventually make their way to the ultimate consumer over the grocer's counter.

This phase of the industry is of growing importance in The Eastern

Shore, and it provides a market right at home for immense quantities of fruits and vegetables. This is particularly true of tomatoes, the leader among canned items. Tomatoes, as we have seen, are produced in all parts of the peninsula, and the canneries, because of the importance of the tomato to the industry, have an equally wide distribution. About seventy-five per cent of the total product of these canneries consists of tomatoes, Delaware alone packing in a single year some thirty-five million three-pound cans of this one vegetable. The tomato pulp and scraps are commonly turned into fertilizer. There are today (exclusive of Virginia) about three hundred and fifty packing-houses in The Eastern Shore, engaged in canning tomatoes, corn, peas, string and lima beans, sweet potatoes, strawberries, blackberries, peaches, apples, and other fruits and vegetables. The Chesapeake fisheries provide the raw material for about a dozen fish and oyster canneries.

Another item of importance in this connection is the presence of thirty large canning establishments in the nearby city of Baltimore. Maryland is the

foremost canning state in the United States, and Baltimore is the only important city center in the canning industry. The Baltimore canneries draw their raw products from several sources, including Norfolk and south Jersey, but they are supplied very largely from the truck farms and fishing grounds which lie just across Chesapeake Bay.

A business closely connected with fruit- and truck-raising is the manufacture of containers in which these products may be sold or shipped. Twenty-five plants producing crates, baskets, and boxes are located in The Eastern Shore, two-thirds of them being situated very appropriately in the berry-producing counties of Kent (Delaware), Sussex, and Wicomico.

TRUCKING, THE FUTURE INDUSTRY

With the results of our inquiry before us, what may we say for the future of The Eastern Shore Country? Along what lines may we look for future ex-

pansion? The answer should not be hard to find. Manufacturing can hope for but little development here. The Eastern Shore lacks power, raw materials, and a labor supply. Only by a wide stretch of the imagination can one look forward hopefully to witnessing here the rise of great industrial centers. The manufacturing of the peninsula seems destined to remain scattered, and to follow lines intimately related to agriculture. Fishing and agriculture are almost certain to be the industries of the future; the former developing with the adoption of sane fishing policies, the latter turning more and more to the growing of vegetables and small fruits. Though grain crops and dairying do very well here, they have made but little progress in the past decade. With the growth of population in our eastern states, intensive culture will become more emphatically the order of the day, and The Eastern Shore Country will take its place as one of our foremost trucking centers.

SUGAR PRODUCTION OF CZECHOSLOVAKIA

Bessie C. Engle

Economic Geographer

CZECHOSLOVAKIA exports more beet sugar than any other country, and more sugar than any other agricultural commodity (Fig. 1).¹ Her production of raw sugar during the seasons of 1909-10 to 1913-14 and 1921-22 to 1923-24 amounted to 5.3 per cent of the world's production of both cane and beet sugar (19,849,154 short tons), and 14 per cent of its beet sugar.² Germany is the only country of Europe which produces more beet sugar than Czechoslovakia, but Czechoslovakia leads the world in sugar production per capita and per acre of arable land³ (Figs. 2, 3, and 4). Czechoslovakia's sugar industry surpasses in economic importance all her agricultural industries, and has held an important place among the industries of the European continent for more than a century (Fig. 5). The sugar crop was accepted as credit in lieu of gold in devising a system of currency to set the machinery of the new Republic going in the autumn of 1918. More than half the sugar has been available for export since the season of 1919-20 (Fig. 6). The sugar exported in 1923-24 had a value of \$63,546,981.20.⁴ The sugar exported in 1925 represented 15.5 per cent of the value of all exports for that year, and headed the list. When sugar does not rank first in value among the total annual exports, it is subordinate to either the cotton yarns and goods group or the coal and

timber group, some years, both. The internal revenue derived from the sugar consumed in Czechoslovakia during the season of 1923-24 amounted to \$4,760,000.⁵

The beet crop is grown on an area (Fig. 7) exceeding one thousand square miles,—an area comparable to that of Rhode Island (1,067 square miles). A steady increase in beet acreage during the past six years, improved economic conditions, and better organization throughout the industry have repaired the damaging effects of the World War on production figures (Fig. 5). The average seasonal production in the four years preceding the War was 1,168,000 tons from beets grown on 740,000 acres.⁶ The relative importance and recent growth of the industry in terms of acreage and production in the various provinces of the country are shown in Figs. 7, 8, and 9. The percentage distribution of arable land among the more important crops in 1922 is shown in Fig. 10.

FACTORS FAVORING THE PRODUCTION OF SUGAR BEETS

The more important factors accounting for the prominent place which Czechoslovakia occupies in the world's sugar industry are to be considered in terms of the natural environment, and economic, social, and political conditions. Soil, climate, and relief are of major importance among the natural environmental factors (Fig. 11).

SOIL

There are considerable areas having deep, fertile loam soils which are rich in

¹ "Czechoslovak Industries, I, The Sugar Trade." *The Central European Observer*, January 19, 1924.

² "Agricultural Yearbook," U. S. Department of Agriculture, 1924, p. 806. The "sugar season" extends from October 1 to September 30.

³ Souček, Dr. Jaroslav: "The Agricultural Industries of Czechoslovakia," in *World Agriculture*, Vol. IV, 1924, p. 353, and "Czechoslovak Industries, I, The Sugar Trade," in *The Central European Observer*, January 19, 1924.

⁴ *The Central European Observer*, September 4, 1925.

⁵ *The Central European Observer*, November 22, 1924.

⁶ Souček, Dr. Jaroslav: "The Agricultural Industries of Czechoslovakia," *World Agriculture*, Vol. IV, 1924, p. 353.

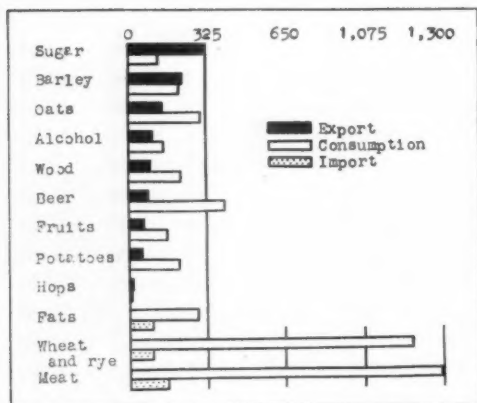


FIGURE 1.—Relation of agricultural production to foreign trade in millions of dollars in 1922. The premier importance of sugar in the export trade of Czechoslovakia is geographically illustrated. (Brdlik, Dr. Vladislav: "Agriculture," about 1923, p. 19.)

lime, and are well drained and aerated. Such conditions permit the type of root development which is very desirable in raising beets for sugar. The tap-root "sprangles" in heavy or thin soils, and the top of the beet shows above the ground. Czechoslovak farmers use large quantities of artificial fertilizers, much of which is imported. Potassium nitrate and superphosphates are especially important in maintaining soil fertility for high beet yields (Fig. 12). The discovery in Czechoslovakia of potash deposits estimated to contain at least

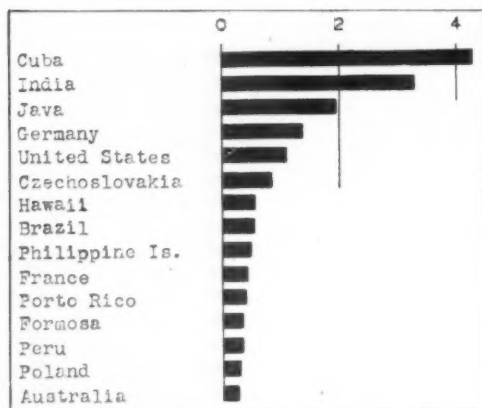


FIGURE 2.—The fifteen leading sugar producing countries of the world, 1921-1922 to 1923-1924, in millions of short tons, raw. Sugar has become one of the important commodities of world trade. ("Agriculture Yearbook," U. S. Dept. of Agriculture, 1924, pp. 806-7.)

70,000,000 tons of potash,⁷ should reduce the cost of sugar production and augment the yield.

CLIMATE

The climate on the whole is quite satisfactory for beet culture in areas having the other favorable natural

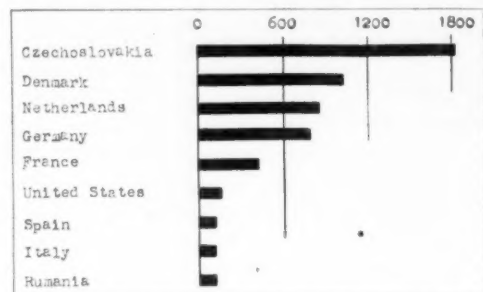


FIGURE 3.—Prewar annual production of sugar in pounds per ten inhabitants. The relative part that the sugar industry plays in the economic life of the Czechoslovakian people is well brought out. (Brdlik, Dr. Vladislav: "Agriculture," about 1923, pp. 14-15.)

environmental conditions. The climatic characteristics of Praha (Prague and Prag) and Brno (Brünn) (Figs. 13 and 14), are assumed to be typical of those which influence the industry, which is

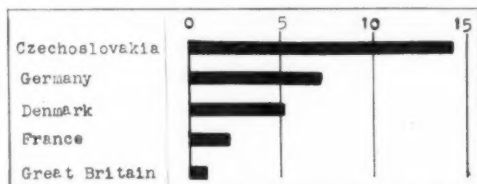


FIGURE 4.—Production of sugar in short tons per acres of cultivated land. The part that the sugar industry plays in the utilization of Czechoslovakian land is forcibly presented. (Brdlik, Dr. Vladislav: "Agriculture," about 1923, p. 8.)

very important in the vicinity of these cities (Figs. 15 and 7). Moreover, climatic data for temperature, precipitation, and relative humidity are available⁸ for these stations over long periods of time. The growing season at Praha and Brno (Figs. 13 and 14) averages about six and four months, respectively. The average temperature in Brno during the

⁷ *Science*, Vol. 58, December 7, 1923, p. xiv.

⁸ Hann, Dr. J.: "Meteorologische Zeitschrift," V. 4, 1887, pp. 91-100 (Brünn); V. 35, 1918, p. 179 (Prag).



FIGURE 5.—Throughout the summer one of the striking human features of the Czechoslovakian agricultural landscapes is the groups of women and children busily engaged in the tedious labor of the sugar-beet fields. (Courtesy of the Czechoslovak Legation.)

three summer months ranges from 63° to 66° F., and in Praha from 70° to 72.8° F. The beet develops a high sugar content under these conditions. The sugar content during the past five years ranged from about 14.86 per cent to 17.42 per cent. The growing season in most of the sugar beet fields in the Brno district is probably longer than four months and warmer than the Brno chart indicates, because of Brno's topographic position (Fig. 15). The amount and distribution of precipitation are essentially the same in Brno and Praha, *i.e.*, moderate and with a maximum during the growing season. Even during occasional summer drought the sugar beet is seldom seriously damaged. This is because of the slight fluctuation of the water table under most of the area, and also because the beet is a root crop. Root crops suffer much less from desiccation during drought than does a crop such as corn with its shallow, even aerial roots, and stalks and leaves exposing a great surface above ground. Forests occupy 33 per cent of the area of Czechoslovakia. They are especially characteristic of the mountains, where they function as blotting paper to the precipitation which is greatest in the highlands, and where the larger streams take their rise. Some of the mountains are jeweled with glacial lakes and others

are above the snow line. Thus forests, lakes, and perennial snow combine in regulating the position of the water table and the volume and velocity of the many streams, along which sugar beets are so

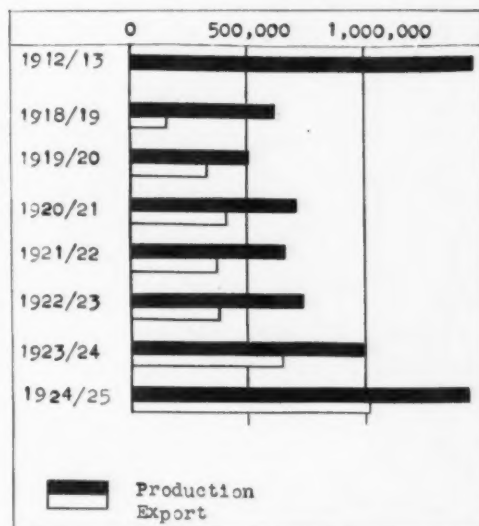


FIGURE 6.—Production and export of sugar (raw) in tons. ("Czechoslovak Industries, I, The Sugar Trade," in *The Central European Observer*, January 19, 1924; "A Record Sugar Year," *idem*, June 26, 1925; *The Central European Observer*, October 23, 1925.)

carefully and faithfully cultivated. The root character of the beet is also a protection against damage from cold. Root crops are only slightly affected when

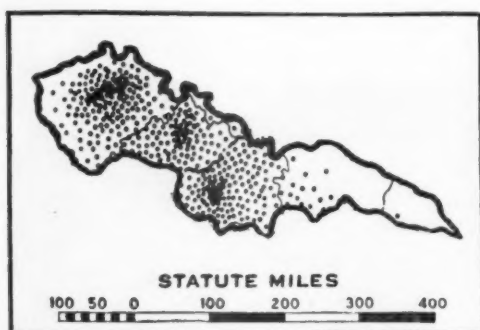


FIGURE 7.—Sugar-beet acreage in Czechoslovakia. Each dot represents 1,000 acres. (Taken from Finch, V. C., and Baker, O. E.: "Geography of the World's Agriculture," 1917, p. 75.)

cereals and other "non-root" crops are being considerably retarded in development because of cold weather, as was the case in Bohemia and Moravia during May and June, 1923.

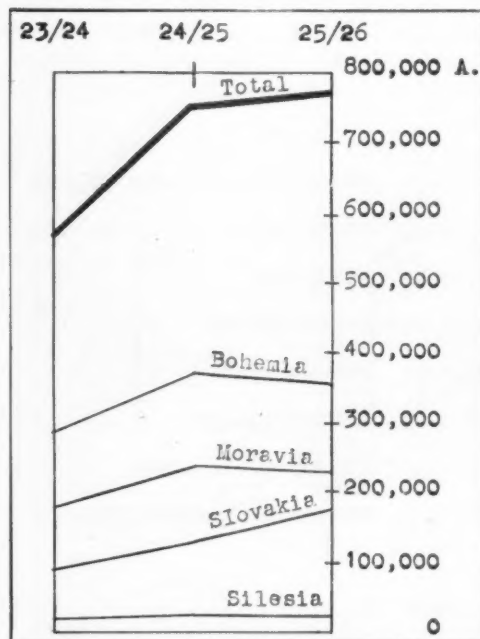


FIGURE 8.—The provincial distribution of sugar-beet acreage. (*The Central European Observer*, January 16, 1925, and December 25, 1925.)

However, satisfactory as the climatic conditions are for sugar beet production, they are not perfect. Czechoslovakia has cyclonic weather conditions. A "hot wave" early in June, 1923, and hail and windstorms in July of the same

year, did great damage to crops.⁹ A crop report in *The Central European Observer* of August 25, 1923, read: "Sugarbeet promises very well, yet for a successful crop moisture is much needed." Another report in the September 22, 1923, issue read in part as follows: "The recent drought has considerably weakened the expectations of an exceptionally favorable sugar campaign in this year. While three months ago, the output was estimated at 30 million metric cwts., there has occurred a sobering down. . . . It may be hoped, however, that the warm and damp weather that set in recently will somewhat help to increase the output, and will facilitate the beet harvest, now imminent." A week later occurred the statement that the campaign (harvest season) opened at Hodonin, Moravia (Fig. 15), on September 21, and that this early beginning was due to the quick maturing of the sugar beet. Excessive rain during the first week in October (the maturation period), resulted in a lowering of the sugar content.¹⁰

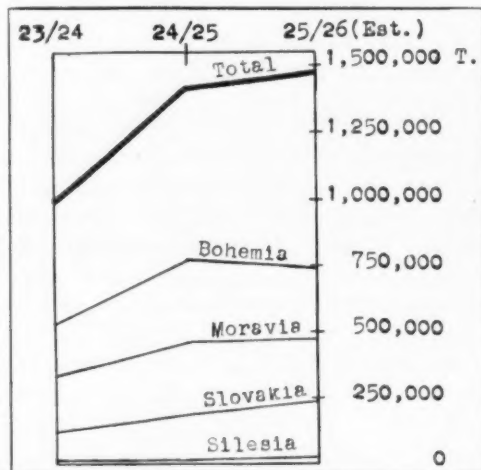


FIGURE 9.—The provincial distribution of sugar production. (*The Central European Observer*, November 29, 1924, and December 25, 1925.)

Early frosts and snows in the autumn before the harvest season has closed are especially detrimental. Early frosts in

⁹ *The Czechoslovak Review*, V. 7, July, 1923, p. 177.

¹⁰ *The Central European Observer*, October 6, 1923, p. 3.

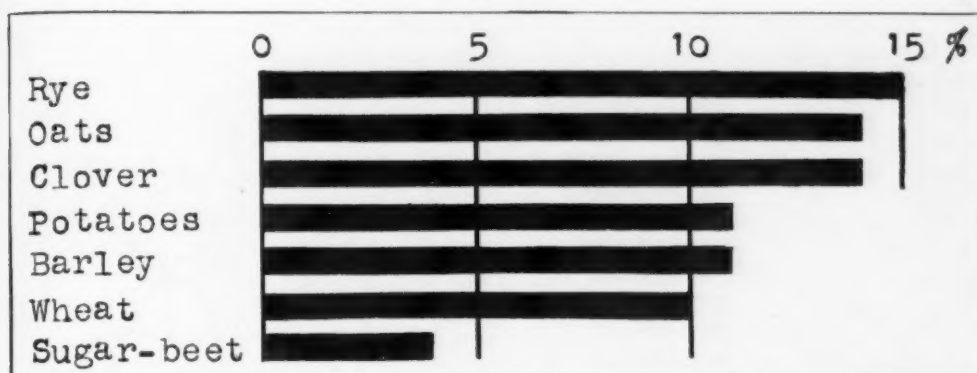


FIGURE 10.—Percentage distribution of arable land among the more important crops, excluding hay (1922). The relative importance of sugar as valuable agricultural export and the relatively minor acreage devoted to the production indicate how intensive an industry sugar-beet growing is for the Czechoslovakian farm. ("The Czechoslovak Republic," Bank of Europe, 1923, p. 9.)

1922 made field work very difficult, and some beets had to be left in the frozen ground.¹¹ A snowstorm occurring October 26, 1919, was unprecedented in the history of the Czechoslovak sugar industry.¹² The bad weather which followed prevented the proper gathering of

cent as against 16 per cent for the preceding season.

RELIEF

The land surface for profitable large scale production, should be plain or nearly so. The more sloping the fields,



FIGURE 11.—The level plains and valleys with their favorable dark soils and suitable climate are especially adapted to the growing and cultivation of sugar-beets. The season of cultivation and harvest is a busy time. Cheapness and abundance of labor are essential to the success of the industry. (Courtesy of the Czechoslovak Legation.)

the beets. Dr. Gustac Heudlet stated¹³ on January 5, 1920, that 10 to 15 per cent of the crop was still in the ground, and that the yield was uncertain. The sugar content was decreased and a great portion of the crop was manufactured into syrup or fed to cattle. The sugar yield of the season's crop was 14 per

¹¹ Editorial in *The Czechoslovak Review*, January 23, 1923, p. 6.

¹² Commerce Reports, No. 129, June, 1920, p. 1267.

¹³ Commerce Reports, No. 8, January 10, 1920, p. 178.

the greater is soil erosion, and consequently the thinner the soil and the greater the difficulty, care, and cost involved in preparing the seed bed, planting, cultivating, and harvesting the crop. There are many permanent rivers along which, in a number of places, are irregular patches and strips of deep, fertile, alluvial soil. Much of this soil is naturally well drained or can be easily drained. The relation between rivers and the more important beet producing areas is seen in Figs. 15 and 7. Some areas of slight

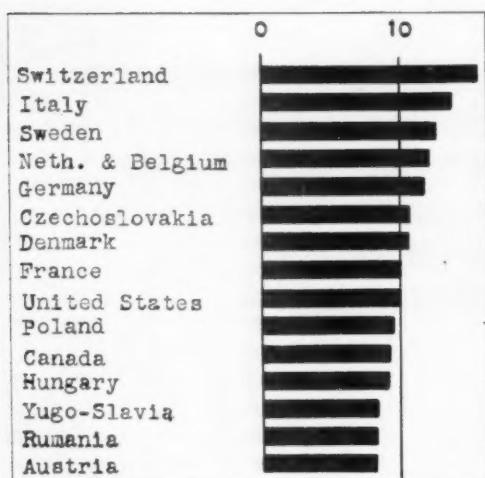


FIGURE 12.—Average yield of sugar-beets in short tons per acre, 1909 to 1913 and 1921 to 1923. ("Agriculture Year Book," U. S. Dept. of Agriculture, 1924, p. 804.)

to moderate slope are underlain with limestone, which produces a very fertile and deep soil. Conditions of soil and land forms permit considerable extension of the sugar beet acreage. Experts state that beet production can be increased by about 530,000 tons.¹⁴

Thus we see that Czechoslovakia scores high with respect to the major characteristics which the sugar beet demands of the chief natural environmental factors,—soil, climate, and relief.

ECONOMIC, SOCIAL, AND POLITICAL CONDITIONS

Beet sugar can be produced on a large scale only where a plentiful and cheap labor supply is available. This is due to the great amount of hand labor required in thinning, weeding, and harvesting the crop. Czechoslovakia has much to her credit in this respect. The population is dense (Fig. 16). Almost half (42.52 per cent, 1921 census) is engaged in agricultural pursuits. The distribution of the population by occupations (Fig. 17) is of special interest when compared with the distribution of the beet acreage (Figs. 7 and 8) and the arable land (Fig. 18). The cost of labor is low. Wages in 1921 were so low throughout

¹⁴ "Land Improvement Fund," in *The Central European Observer*, August 7, 1925.

Bohemia that it was cheaper to have stock herded than to build fences.¹⁵

Women and children are an important element of the agricultural laborers.

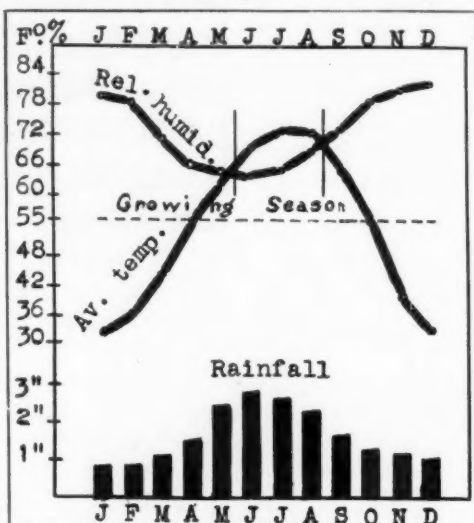


FIGURE 13.—Average monthly precipitation, temperature, and relative humidity in Praha (647 ft. above sea level). Average annual precipitation, 19.1 inches during 70 years. Temperature and relative humidity data charted from 60 year records.

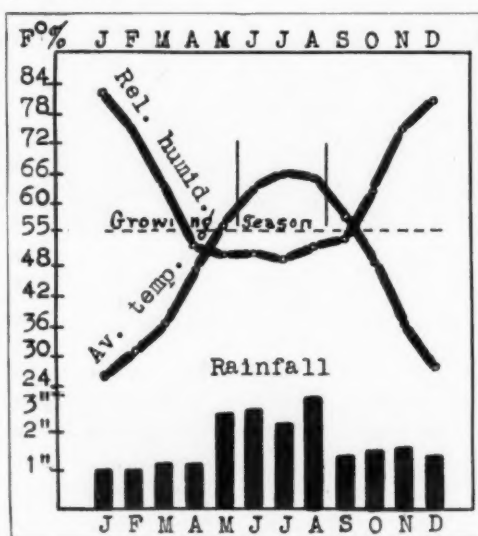


FIGURE 14.—Average monthly precipitation, temperature, and relative humidity in Brno (745 ft. above sea level). Average annual precipitation, 20 inches during 35 years. Temperature and relative humidity data charted from 30 year records.

¹⁵ Williams, M. O.: "Czechoslovakia, Key-Land to Central Europe," *Nat. Geog. Mag.*, V. 39, 1921, p. 126.

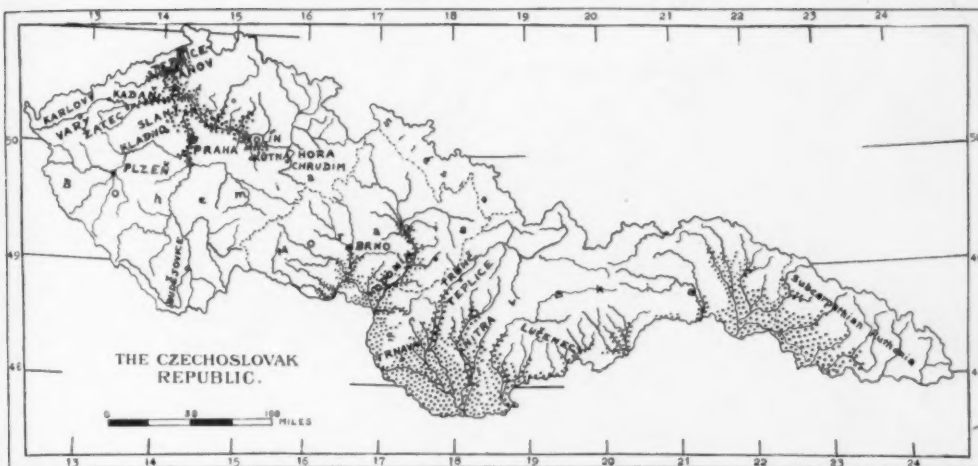


FIGURE 15.—Drainage pattern. Dotted areas consist chiefly of alluvium and are less than 800 or 1,000 feet above sea level (the elevation was determined by estimation from a number of physical maps. Adapted from two maps drawn by František Machat and appearing in Čísař, Jaroslav and Pokorný, František: *The Czechoslovak Republic*, 1922, and in weekly statements of the Banking Office of the Ministry of Finance, Prague, during the autumn of 1923, and spring of 1924.

Women have worked in the fields for centuries.¹⁶ They do the major portion of the work on the threshing crew while using the combined thrasher and baler.¹⁷

One traveling by rail or motor car in autumn from Budapest to Dresden via Brno and Praha, would see Czechoslovakia's beet harvest at its height.

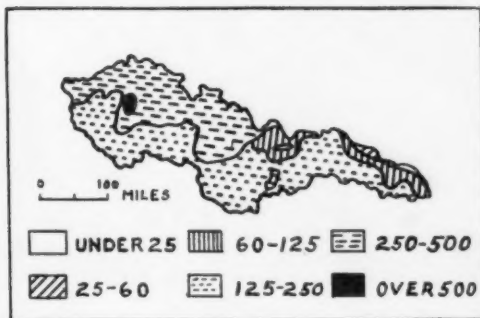


FIGURE 16.—Density of population per square mile in Czechoslovakia. (Courtesy of Dr. J. Paule Good: *School Atlas*, 1923, p. 69.)

Fields, in places extending to the horizon, are then variegated with motley groups of men, women, and children, who pull and trim the beets, and load them for conveyance to the railway station or to a nearby sugar factory (Fig. 5).

¹⁶ Straka, J.: "Pages from Czechoslovakia," *Czechoslovak Review*, Dec., 1922, p. 324.

¹⁷ Williams, M. O.: "Czechoslovakia, Key-Land to Central Europe," *Nat. Geog. Mag.*, V. 39, 1921, p. 122.

"Lazy, languid-eyed oxen with horns sometimes long enough to suggest to the passerby that it is safer to walk in the roadside ditch, crawl leisurely in picturesque procession along the highways, lugging their piled-up loads of beet in carts so unlike anything seen in England, but apparently the proper and serviceable thing in this part of the world (Fig. 11 and 19). At night the factories are ablaze with light and alive with activity, for the beet must be worked up as rapidly as possible. The providing of railway trucks for its conveyance is perhaps the severest test

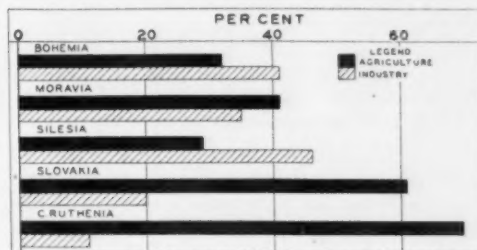


FIGURE 17.—Distribution of population by occupation in 1910. (Čísař, Jaroslav and Pokorný, František: "The Czechoslovak Republic," 1922, p. 15.)

that the State railways have to stand during the whole year, and at hundreds of stations small mountains of beet are to be seen awaiting due removal. Within practically one month, some seven

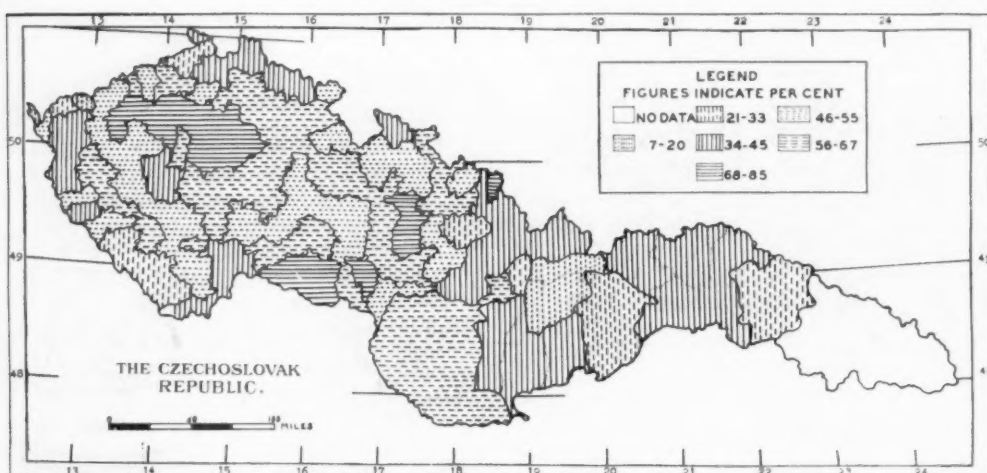


FIGURE 18.—Arable land by administrative and judicial districts, in Bohemia and Moravia, and by countries in Slovakia. (From Orna Puda, *Die Dr. Jos. z Lorenz-Liburnau*.)

million tons of beet have to be dealt with by the railways, to say nothing of the beet pulp which is subsequently conveyed from the factories back to the farms for fodder purposes."¹⁸

Teplíce-Sanov, eastward to Chrudim, and including Praha, Žatec, Slaný, Kladno, Kolín, and Kutná Hora. There are also many other industries in Praha, notably those of beer and alcohol,



FIGURE 19.—Lazy, languid-eyed oxen move leisurely in picturesque procession across the fields of sugar-beets, drawing the modern cultivators now in use. (Courtesy of the Czechoslovak Legation.)

Many of the important sugar producing districts are also great centers for the manufacture of products with little or no labor contributed by women and children at any stage of the industry. The timber and steel industries are of such a character. The sugar and iron industries occur together in the sugar district extending from Kadaň, about eighteen miles north-east of Karlovy Vary (Carlsbad) and

employing more men than women. A similar condition occurs at Budějovice (Budweis). Timber and sugar coexist in Nitra and Trenč Teplíce. The wives and children of these factory workers are not uncommonly employed at small cost in agricultural work. These conditions are important to Czechoslovakia's high rank with reference to a plentiful and cheap labor supply.

So far as the competition of crops for the time of the farmer is concerned, his

¹⁸ "Sugar", an editorial in *The Central European Observer*, October 18, 1924, p. 2.



FIGURE 20.—The College of Agriculture at Brno, Czechoslovakia, where students receive their final training, and where much research is done. (Courtesy of the Czechoslovak Legation.)

schedule as given below is substantially correct. Oats and barley are almost entirely spring-sown, and this usually occurs before beet and potato planting. Beets and potatoes are planted almost simultaneously. Potatoes at the time of planting make greater demands than beets upon the labor supply because of the cutting of the seed potatoes. The preparation of the beet seed bed, on the

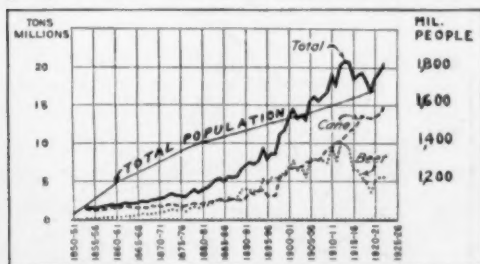


FIGURE 21.—Relation of the world's sugar production to increase in population. ("Agriculture Year Book," U. S. Dept. of Agriculture, 1923, p. 216, and "The Americana," Vol. 22, 1919, p. 369.)

other hand, involves much more work than that of the potato seed bed. Once the crops are above ground, beets require many times more work than do potatoes, much of which is hand work. Cultivation of potatoes ends long before the painstaking hoeing and weeding of beets ceases. Potato harvest is usually complete before the beet campaign opens. There are also crops of oats, barley, and fall-sown wheat and rye, but these require no labor from the time of planting to the time of harvesting, and their harvest

is past when the labor supply is needed for the beet campaign. Although it has been impossible to secure facts concerning crop rotation, perhaps in some cases the beet crop is followed by wheat or rye. The available information does not indicate any serious shortage of labor for the beet industry because of competition among the major crops for the time of the farmer.

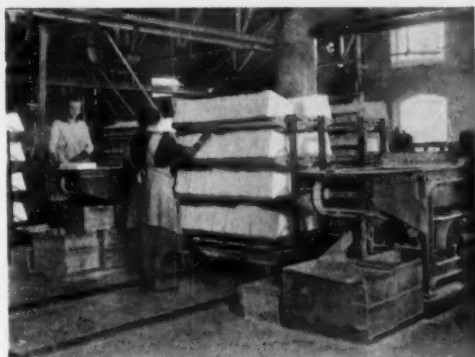


FIGURE 22.—Trimming sugar into cubes of standard size and weight for exportation and home use. (Courtesy of the Czechoslovak Legation.)

The sugar beet distribution in Czechoslovakia reflects the conditions of inhospitably dissected land surfaces, dense forests, and unfavorable soil and climate in much of Slovakia and Ruthenia (Fig. 7). Political and economic conditions in this part of the country were all but unbearable for about a thousand years,—the rule of the Magyars—prior to the formation of the Czechoslovak Republic in October, 1918. A result of these conditions is a much lower stage of agricultural development than in either Moravia or Bohemia. In 1910 about 27.8 per cent of the Slovaks were illiterate, while in Bohemia, Moravia, and Silesia $2\frac{1}{3}$ per cent of the population was so classed.¹⁹ Laborers are fewer and less dependable than in the more advanced western portion of the Republic. Many of the more aggressive individuals emigrated from the "East End" to countries offering them the freedom

¹⁹ Bach, Teresa: "Education in Czechoslovakia," Bul. No. 39, 1922, Dept. of the Interior, Bureau of Education, Washington, D.C.

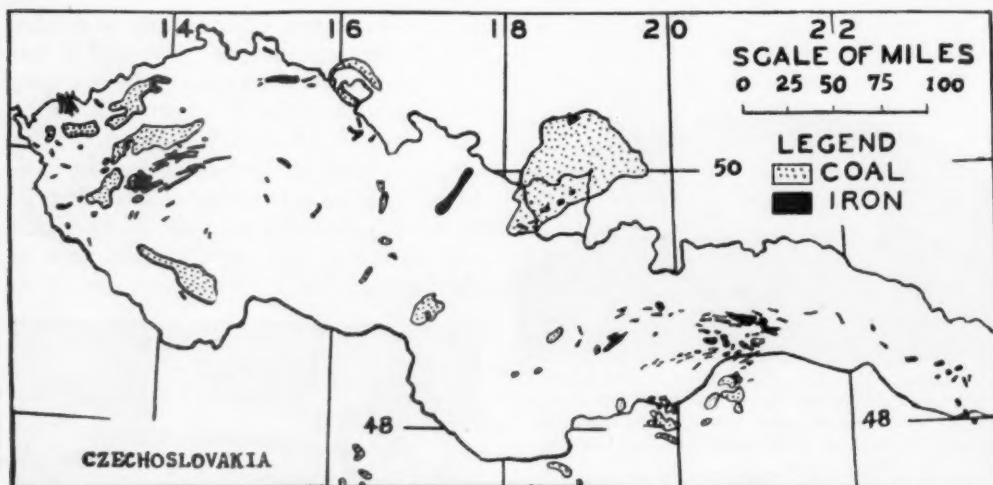


FIGURE 23.—Distribution of Coal and Iron resources of Czechoslovakia.

which was denied at home. Many of the home folk became disheartened, aimless, and profligate. An abundance of intoxicating liquor aggravated the situation.

There are areas in southern Slovakia and Ruthenia which are capable of producing sugar beets if wheat acreage and production are a reliable index. Both wheat and sugar beets require fertile soils and are important in the same general areas of Moravia and Bohemia. The establishment of sugar factories in Slovakia met with disfavor until the formation of the Republic. The heavy, bulky and rather perishable beets are seldom sent long distances. Lines of communication were chiefly from north

to south, and connection between Slovakia and the factories of Moravia was very poor and indefinite. Therefore marketing in the big sugar centers was almost prohibited and little attention

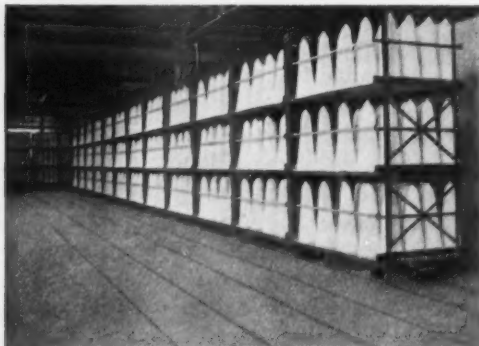


FIGURE 24.—Sugar cones, great conical loaves of sugar from the concentration and crystallization tanks, set out on trucks to dry; saccharine ingots to tempt the "sweet tooth." (Courtesy of the Czechoslovak Legation.)

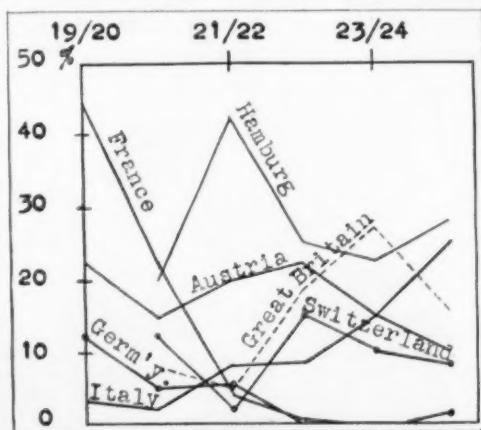


FIGURE 25.—Principal destinations of Czechoslovakian sugar exports. (*Gazette de Prague*, October 28, 1925, p. 3, and *The Central European Observer*, March 29, 1924.)

was given to beet culture. Rapid progress has been made since the establishment of the Republic in improving economic, social, and political conditions in the "East End." Among the remedial measures are railroads which provide much better facilities for communicating with Moravia and Bohemia, and schools which offer general and vocational training. Three thousand schools were or-



FIGURE 26.—Czechoslovakia's landlocked borders permit no merchant marine, but the river-ways are utilized to the full. (Courtesy of the Czechoslovak Legation.)

ganized during the first four years of the Republic.²⁰ Agricultural education is receiving special emphasis (Fig 20). The fact that plans were made to send 10,000 to 15,000 farm hands during the summer of 1923 from Slovakia to France, where they were to help with the crops,²¹ may indicate a plentiful labor supply which is so very essential to commercial sugar beet production. Or it may reflect political motives,—such as an assurance of a desire to maintain friendly diplomatic relations with the French nation. As the eastern part of Czechoslovakia develops, an extension of the sugar beet industry in this direction is to be expected (Figs. 8 and 9). A new factory is to be started at Lucenec, according to the Tribuna.

Sugar growers are not solicitous concerning a market. The world's "sweet tooth" grows larger and longer (Fig. 21). "Czechoslovakia has, of course, a material interest in an extended consumption

of sugar, for she exports more of this commodity than any other country in Europe, and a good deal of it goes to England where some three million tons of sugar have been consumed in the last ten months—a larger quantity by far, in proportion to population, than consumed in any other country in the world. It has been said (presumably by an Englishman) that the degree of civilization of a people is to be gauged by the amount of sugar they consume, and a good deal of daintiness and taste may, it is true, be traced to sugar, while a certain quantity is essential for coating pills that would otherwise be very unpleasant to eye and palate. In Czechoslovakia both production and consumption of this desirable commodity are on the increase—a proof that production is satisfactory to the producer and that the consumer is doing well enough to enable him to increase his indulgence in a wholesale and, let us hope, civilizing, luxury."²²

²⁰ *The Czechoslovak Review*, Dec., 1922, p. 312.

²¹ *The Central European Observer*, June 23, 1923.

²² "A Sweet Tooth," an editorial in *The Central European Observer*, August 21, 1925.

The beet-sugar industry can be invested in with the assurance of a market and a fixed price for the crop before it is grown. Sugar factories or refineries are the markets for most of the beet growers.

ORGANIZATION OF THE INDUSTRY

The Czechoslovak sugar industry owes its present high plane of efficiency to intelligent organization, new technical inventions, and great advance in methods of cultivating the beet. Much progress

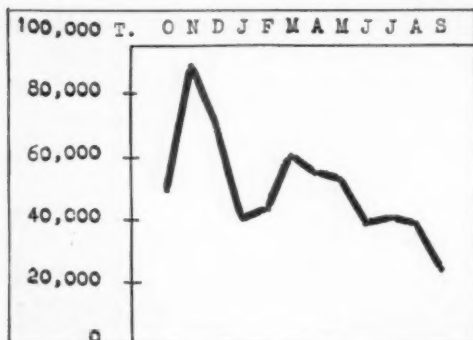


FIGURE 27.—Exports in tonnage by months, 1920–1921 to 1924–1925 inclusive. ("Le développement de L'industrie sucrière tchécoslovaque depuis 1920," in *Gazette de Prague*, October 28, 1925, p. 3.)

has been made in the organization and stabilization of the industry since the formation of the Republic. Agricultural industries were seriously depressed during and after the War. Among the reasons are: a shortage of labor and fertilizers; reduction of cattle to the number of 37.5 per cent of the pre-war herd; and arbitrarily fixed prices which left a great disparity between domestic and world prices. Agricultural production in 1919 was 60 per cent of the pre-war average.²³ Sugar production was reduced 50 per cent.²⁴

A Government "Sugar Commission" supervised all sales and export of this commodity from the early days of the Republic until 1921. The commission was then replaced by a "Sugar Syndicate" comprising beet-growers, manufacturers, and refiners, who, with the

²³ Brdlík, Dr. Vladislav: "Agriculture," about 1923, p. 18.

²⁴ Commerce Reports, No. 91, April 17, 1920, p. 340.

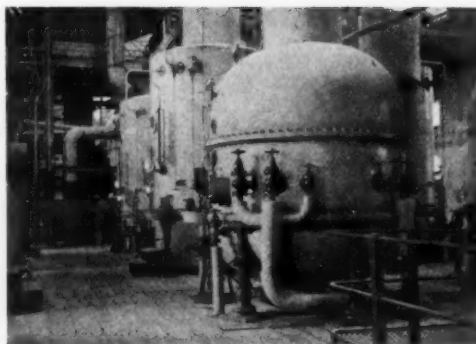


FIGURE 28.—The great retorts and conduits of a sugar factory represent a heavy investment in capital and technical skill. (Courtesy of the Czechoslovak Legation.)

consent of the government, control the sugar trade. Later developments in organization pertaining to the export of sugar are discussed under the heading, "Relation of the Sugar Industry to Foreign Markets." All export transactions are delegated by the "Sugar Syndicate" to the "Czechoslovak Sugar Export Co. Ltd." with headquarters at Praha. This institution is under the

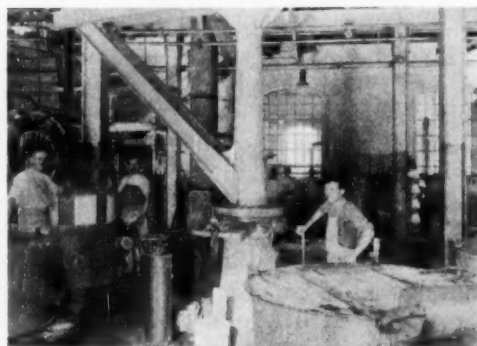


FIGURE 29.—In the busy season the macerating and expressing departments of a sugar factory are kept going continuously in order that the utmost sugar content of the beets may be extracted. (Courtesy of the Czechoslovak Legation.)

control of the Ministry of Finance and the Board of Foreign Trade.²⁵

There are many district associations such as the Central Bohemian Association of Sugar Manufacturers and the Society for Sugar Production of Eastern Bohemia, which are united in a "Central Federation of the Czechoslovak Sugar

²⁵ Cisař, Jaroslav and Pokorný, František: *The Czechoslovak Republic*, 1922, p. 111.

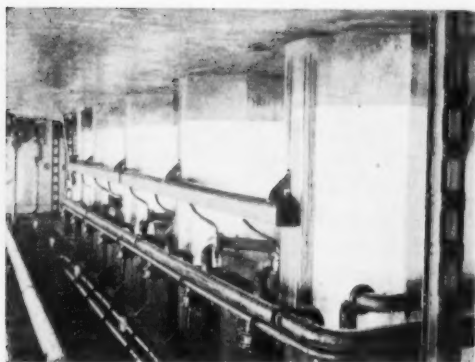


FIGURE 30.—The diffusion room in one of the great sugar factories at Hulin, Czechoslovakia. The extraction and refinement of sugar from beet root is almost as much a function of geographic conditions as is the production of the crop. (Courtesy of the Czechoslovak Legation.)

Industry" at Praha. This Federation issues two weekly papers, and has a seed-selecting institute at Dobruška and a research institute at Brno. Special experimental farms are located at Větrušice and Radbor (Bohemia), Kvasice (Moravia), and Senec (Slovakia). The research institute at Praha has been testing the Bohemian sugar beet seed annually for fourteen years, dates from 1896, and ranks among the better equipped institutions of its kind in the world. The sugar content of the beet has been increased from 12 to 16 per cent since 1870, and has reached 24 per cent during very dry harvest seasons. A sugar insurance company covers all factories. The problem of a steady and continuous supply of raw materials to the factories and refineries is met by the distribution of allotments to the various factories.²⁶ The organization strives for maximum coöperation of all concerned. The result is a first class commodity capable of meeting any reasonable competition in the market (Fig. 22 and 24).

There are 15 joint stock companies in Bohemia with beet-growers as stock holders.²⁷ Certain factories have estates producing 30 to 40 per cent of their beet requirements. The remainder is

supplied by small growers under contract. Some manufacturers get all their beets on contracts. One concern contracts with 2,000 small growers.²⁸ There are 14 stock companies, formed by beet-growers, in Moravia and Silesia. About half the supply of beets is raised on estates operated by refineries. Refineries in Slovakia grow about 90 per cent of their requirements on large estates which they operate, while the remainder is supplied by small land owners under contract.

Among the factors which are important in determining the location of beet sugar factories and refineries are: (1), nearness to the beets; (2), abundance of pure water; (3), accessibility to large supplies of lime; and (4), cheap fuel (Figs. 7, 15, and 23, respectively). The

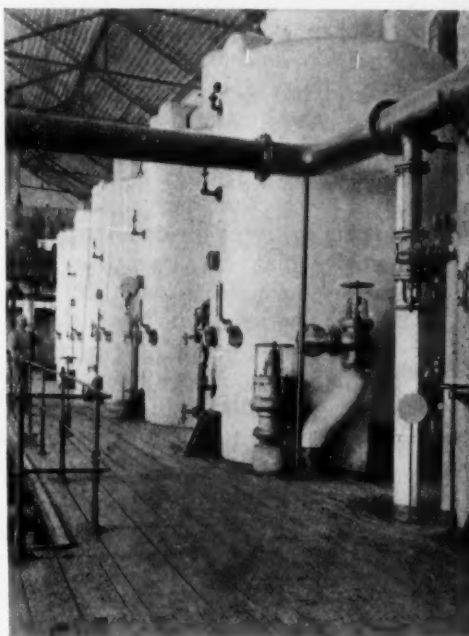


FIGURE 31.—The saturation rooms with their great vats and gauges and conduits are kept as immaculately clean and "sweet" as is the whole plant. Like flour-milling and dairying, sugar refining must be kept "clean." (Courtesy of the Czechoslovak Legation.)

facts available do not make it possible to distinguish clearly between sugar factories, whose product is raw sugar,

²⁶ Commerce Reports, No. 129, June 2, 1920, p. 1268; and Císař, Jaroslav and Pokorný, František: *The Czechoslovak Republic*, 1922, p. 110.

²⁷ Císař, Jaroslav and Pokorný, František: *The Czechoslovak Review*, 1922, p. 110.

²⁸ Commerce Reports, No. 129, June 1920, p. 1268.

and refineries, whose product is refined sugar. It is safe to assume that the factory is much nearer the beet fields, in case the refinery and factory are not in the same place. Although sugar refineries are found in many sugar importing ports, Czechoslovakia exports large quantities of refined sugar.

There are 171 factories and refineries, distributed as follows: in Bohemia, 109; Moravia, 47; Slovakia, 10; and Silesia, 5. The potential output is 1,700,000 tons of sugar²⁹ (Fig. 6). There is a marked tendency toward amalgamation of the factory units. The largest factory is that of Krásné Březno (Schön-priesen), established chiefly for export, especially to England. This company recently declared a dividend of 27½ per cent per share.³⁰ Next in order of size are the factories of Nestomice, which paid a 25 per cent dividend for the 1924-25 season, and Trnava (Tyrnau), Slovakia. The location of the Nestomice factory has not been definitely determined, probably because it rises amid the beet fields some distance from a town or city. Many factories are so situated. There is some evidence for believing that the Nestomice plant is at or near Ústí (Aussig), Bohemia. At least 20 factories and refineries paid their shareholders, in 1925, dividends ranging from 10 per cent to 50 per cent per share. The dividends paid by twelve of these companies amounted to 20 per cent or more per share.

FOREIGN MARKETS

Leaders of the Czechoslovak sugar industry realize the necessity of following closely the trend of economic and political conditions in both competing and purchasing countries because of the growing dependence upon foreign markets for the bulk of the sugar output. A meeting at Praha was called for March 27, 1925, for the purpose of constituting a Sugar Exporters Association, to be representative of refiners, banks engaged

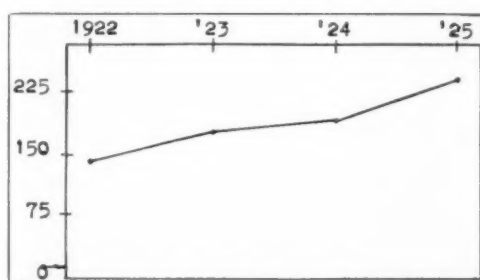


FIGURE 32.—Production of molasses in thousands of tons. (*The Central European Observer*, August 30, 1924, October 25, 1924, and January 23, 1925.)

in the sale of sugar, and private firms selling sugar to foreign countries, the object of the association being to protect the interests of Czechoslovak sugar exporters abroad.³¹

The chairman of the annual "Sugar Day," a convention of the organizations connected with the sugar industry, held on June 10, 1925, at Luhačovice, Moravia, stated that the production of cane sugar was increasing to such an amount as to soon compete in markets supplied by Czechoslovakia. The French sugar industry has been restored to its pre-war level, and France is no longer significant as a market (Fig. 25). Czechoslovakia has practically a monopoly on the Austrian market because of geographic conditions, but Austria is increasing her production. Switzerland, lacking suitable soil for beet growing, is erecting refineries, and will import raw sugar instead of refined. The Balkans, except for Greece, can almost supply local demands. Italian production is being encouraged by means of re-imposed import duties. Czechoslovakia's best customer, England, has been attempting for several years to establish a sugar beet industry of her own. Sugar producers on the continent are watching these efforts with interest. "Time only will show whether the agricultural and labor conditions alone, in England, are not too great a handicap—unless the young industry is to be protected by tariffs for years till it

²⁹ Brdlik, Dr. Vladislav: "Agriculture," about 1923, p. 8.

³⁰ *The Central European Observer*, May 31, 1924.

³¹ "A Czechoslovak Sugar Exporters Association," *The Central European Observer*, March 20, 1925.

can successfully meet old and resourceful competition." "New beet sugar factories are still being established in England and the movement has even spread to Carlowe in the Irish Free State." So read an article in the September 25, 1925, issue of *The Central European Observer*. The exports listed in 1924-25 for Hamburg (Fig. 25) went largely to the Baltic States and Russia,—markets in danger of being lost because of the creation of a sugar industry in the Baltic States, and by Russia's efforts to increase her production to the pre-war level. Czechoslovakia looks to the near Orient, Greece, and Turkey, for a revival of her traditional export trade in sugar, when political and economic conditions become more settled.³²

The cost of production must be kept down if Czechoslovakia is to maintain her export trade in sugar. Experts regard the 1925-26 season one which will be accompanied by serious problems. Hope of meeting the situation successfully is based upon the fact that conditions for beet growing are more favorable than in most competing countries, and that the technical equipment of factories and refineries is of the highest order. The chairman of the 1925 "Sugar Day" remarked that the government in concluding commercial treaties must see that no higher duties are placed on Czechoslovak sugar than on that of a competing country, and that the export duty on refined sugar must not differ more than 15 per cent from that on raw sugar, also that Czechoslovakia's landlocked condition calls for special transport tariffs (Fig. 26).

Hamburg (free port), Italy, Great Britain, Austria, and Switzerland are the five great markets for sugar exported from Czechoslovakia (Fig. 25). The exports fluctuate widely throughout the season (Fig. 27). The peak occurs in November, during or immediately after the height of the manufacturing period, and prior to the time when transpor-

tation is delayed by winter conditions. The marked decline in December, January, and February, is the result primarily of the frozen state of the River Elbe. Shipments via Hamburg were prevented in January, 1924, were much below normal in February, and were somewhat affected in March of the same year, due to the Elbe being icebound. Boats with some 50,000 tons of sugar in transit from Czechoslovakia to Hamburg were frozen in and held up at various points on the Elbe in December 1925. Less sugar is exported in September than in any other month. Likewise a minimum amount is on hand at this time, as everything is being put in readiness for handling the new crop with greatest possible dexterity.

RELATION OF THE SUGAR INDUSTRY TO SOME OTHER ECONOMIC ACTIVITIES

The sugar industry is closely allied with several other industries. Its development stimulated the manufacture of machinery and apparatus for sugar factories and refineries. The machines of the Bohemian-Moravian Machinery, the Amalgamated Machineries and of Breitfeld, Daněk & Co., Ltd., in Praha, are well known in all sugar producing countries (Figs. 28, 29 and 30). Other important manufacturers of sugar factory plant and equipment are the Skoda Works at Plzeň (Pilsen), Českomoravská (Kolben) Engineering Co. at Praha with some fifty years specialization in this line, and Brand & Lhuiller at Brno. The Russian Sacharotrust sent a commission to Czechoslovakia the first week in January 1926 for the purpose of making a study of sugar factory plant and equipment, prior to placing an order for such machinery (Fig. 31).³³

The chocolate and sweets industries are in part an offspring of the sugar industry, and are represented by 60 factories.³⁴ Almost the whole output is for domestic consumption.

³³ *The Central European Observer*, January 1, 1926, p. 12.

³⁴ *Průmysl potravinářský* (provisions trade journal), quotation in *The Central European Observer*, January 12, 1924.

³² "Sugar Production in 1923-24 in Czechoslovakia," *The Central European Observer*, March 29, 1924.



FIGURE 33.—The famous old cities of Czechoslovakia are quaint combinations of ancient, medieval, and modern. The bloody wars of centuries have raged about them and over the fertile fields from which they draw their life, but serene and stately they stand, superior to the transient vicissitudes of any one age. Prague is one of the busy, beautiful cities of the land. (Courtesy of the Czechoslovak Legation.)

Molasses is an important product of the sugar factories (Fig. 32). Numerous inquiries from abroad regarding this commodity, indicate a bright future for the export of a considerable surplus. The quantity exported in 1923-24 (60,578 tons) exceed that of the previous season by 43,465 tons. Alcohol is manufactured from molasses in 28 commercial distilleries combined with refineries.

The sugar industry opens a large field for the employment of labor and the investment of capital. Banking and other mercantile business take on greater activity. Markets are opened for materials required in operating the industry: coal amounting to 20 per cent of the beets by weight, lime rock to the extent of 8 per cent by weight of the crude beets, and coke equivalent to $\frac{1}{10}$ the lime by weight.³⁵ While these figures are for the beet sugar

³⁵ Gove, Aaron, Representative of the Beet Sugar Industry in the Arid States, "Americana," V. 3, 1918, p. 436.

industry of the United States, they probably would not be greatly different for that of Czechoslovakia, and therefore serve the present purpose in a general way. Facilities for transportation are improved for the purpose of assembling these materials and marketing the finished product.

The farmers are heavy share holders in the benefits accruing from the sugar beet industry. A definite income is assured. In addition, the sugar mills supply the farmers with about half the molasses produced, valuable stock food and fertilizer in the form of beet waste, consisting of tops and pulp, and fertilizer from the cakes of carbonate of lime.

One acre of beets produces about 2,000 pounds of digestible tops and leaves. The pulp comprises about 50 per cent by weight of the beet, and is almost as valuable for stock food as the beet itself. One acre of corn produces about 3,600

pounds of digestible ensilage, but there is no additional money crop. The beet tops and pulp may enter into a ration for any stock. They are especially good for dairy cows. While the concentration of cattle, dairy cows, and swine, is not especially marked in the areas of great sugar production, cattle are much more numerous in Bohemia where the sugar beet acreage is greatest. The combination of sugar beet growing and livestock raising increases the food supply of the farmer, and assists in maintaining soil fertility by means of animal manure and beet pulp, thereby reducing the expense of farm upkeep. The sugar beet grower reaps other benefits. A superior quality of land is produced by the deep plowing, thorough harrowing, and constant weeding and cultivation required. Other crops are grown at less expense, and yield better than on less well cultivated soil because of the absence of weeds and grass. The whole farm is

ultimately brought to this high state of fertility and productiveness by means of crop rotation, granted that all parts offer proper conditions for sugar beet raising.

SUMMARY

The beet sugar industry of Czechoslovakia reflects a high state of development in the agricultural, manufactural, and commercial life of the Republic (Fig. 33). Sugar is an integral part of Czechoslovakia agriculture, manufacture, and export trade. The raw material is produced exclusively in the country under natural conditions favorable to its growth, and by farmers with long tradition and experience in beet culture. The manufactured article first meets home consumption which would otherwise have to be met by large imports. Half, or more, of the output is available on the average for export. All the requisites for its manufacture are supplied by home industry!

THE IMPORT TRADE OF THE UNITED STATES

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THE nature of the development of the import trade of the United States and its probable future trends can better be understood if it is considered in comparison with, and in relation to, the export trade. While there has been during the century a generally continuous increase in the value of both imports and exports, the rate of increase has greatly varied from period to period and the relation of imports to exports has changed markedly.

rapidly, partly as a result of the stimulation to exports following the expansion of the country's industries and agriculture, especially the export of raw cotton, partly as a result of the necessity of paying interest on the capital previously borrowed.

At the same time imports were less stimulated since foreign investments in the United States following the depression of 1837 declined and the decreasing earnings from the declining American



FIGURE 1.—The lower end of Manhattan Island, with its cordilleran array of skyscraper towers, is one of the wonders of the modern world, one of the spectacular phenomena of world trade and industry. (Courtesy of I. Underhill, New York.)

THE IMPORT TRADE AND ITS RELATION TO EXPORTS

Before 1850, the growth of United States foreign trade was slow. Prior to 1837, imports exceeded exports in value. This excess of imports was made possible principally by the earnings of the American merchant marine and by investments by Europeans in new enterprises in the United States, payments for both of which were received in the form of imported merchandise. From 1837 to 1849, however, exports increased more

merchant marine were needed to balance the indebtedness of America on account of interest payments rather than to pay for imported merchandise. From 1837 to 1849, therefore, exports of merchandise came slightly to exceed imports in value, reversing the balance that maintained previous to 1837.¹

The period from 1850 to 1896 differed from the preceding period in that it was

¹See Bullock, Williams and Tucker: "Our Balance of Trade." Review of Economic Statistics, 1920.



FIGURE 2.—The commodious New York Harbor has helped the city achieve its eminent position in the trade of the world. The docks of lower Manhattan are but an example of the great extent of dock and wharf facilities afforded by this colossus among world ports. (Courtesy of Brown Bros.)

a period of moderately rapid expansion of the foreign trade of the United States. It was similar to it in that the import balance, which after 1850 had again been reestablished, was overturned during the period to an export balance. The rate of trade expansion varied during the period. From 1850 to 1873 the increase of imports was rapid, except for the slump during the Civil War.

Exports increased less rapidly and from 1850 to 1873, imports were much in excess of exports. This expansion of imports was a result of very large foreign capital investments in the United States during the period of railroad building and the expansion of agriculture that followed the Civil War. It was also the result of the discovery of gold in California and the consequent large gold production by means of which payment for excess imports was further made possible.²

Following 1873, however, the import trade, while increasing in value and in quantity, did not keep pace with the

growth of population. Exports, on the other hand, were stimulated and, except for the years 1875, 1888 and 1893, exceeded imports every year after 1873. The expansion of exports was made possible by the greatly expanded production power of the United States resulting from the era of railroad building and the spread of population into the West.

Excess exports were necessary in order to meet interest payments on the funds previously borrowed and also in order that settlement could be made for other invisible items in our trade account that previously had been small or non-existent. Chief among these invisible items were ocean freights payable to foreign merchant marines and tourist expenditures resulting from American travel abroad. The American merchant marine had become insignificant as a carrier of foreign commerce after the Civil War, thus making it necessary each year for American merchants to provide large sums for payments to foreign shipowners.

Following 1896 is a period of enormous

² Bullock, Williams and Tucker: "Our Balance of Trade." Review of Economic Statistics, 1920.

TABLE I
IMPORTS AND EXPORTS OF THE UNITED STATES AND BALANCE OF TRADE—
1820-1924
(Millions of Dollars)

Yearly Average	Imports	Exports	Excess exports (+) or imports (-)
1820-29.....	74	69	-5
1830-39.....	116	98	-18
1840-49.....	111	117	+6
1850-59.....	266	230	-36
1860-64.....	278	221	-57
1865-69.....	369	275	-94
1870-74.....	558	478	-80
1875-79.....	466	612	+146
1880-84.....	685	811	+125
1885-89.....	675	715	+40
1890-94.....	797	902	+106
1895-99.....	717	1040	+322
1900-04.....	919	1429	+510
1905-10.....	1257	1733	+476
1910-14.....	1689	2166	+477
1915-20.....	3223	6261	+3039
1921-24.....	3256	4269	+1013

increase in the foreign trade of the United States. While both the export and import trade increased, exports expanded the more rapidly creating an enormous "favorable trade balance."

The reasons for the rapid increase in exports are many. The population of the country had now become large; railways and mines and factories and

farms had been developed and were in position to produce in greater quantities than ever before; free lands were gone and American capitalists had begun to pay more attention to trade and investment outside of the United States; large payments were due in interest and principal on the sums that had been invested by foreign capitalists in United States

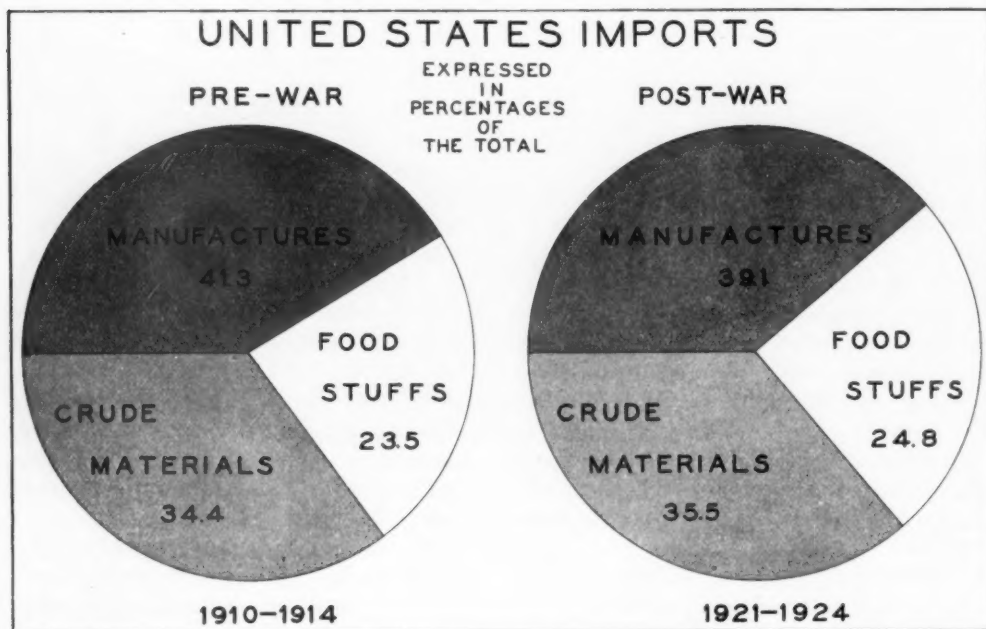


FIGURE 3.—A comparison of pre-war and post-war imports into the United States reveals the gradual transition in the character of the nation's industries. The percentage import of manufactures diminishes as the import of crude materials and foodstuffs increases.

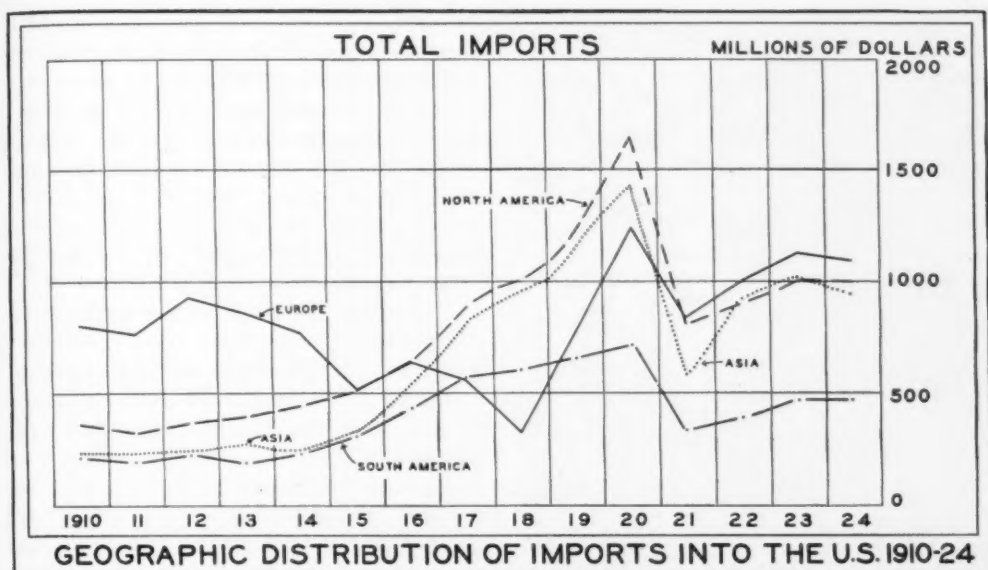


FIGURE 4.—The imports from Europe into the United States have assumed prime importance since 1921. For the five years previous imports from Asia and North American neighbors had been more valuable.

enterprises; emigrants, which had been coming to the United States in ever increasing numbers were now remitting large sums to relatives and friends in Europe; and American tourists were spending other large amounts in travel, pleasure and business outside our own borders.

All these factors created both the necessity for exports and the ability to export to meet the necessity. The export trade was the means by which the country could pay its obligations to foreign creditors for goods and services previously imported, and at the same time command constantly increasing quantities of imported goods and services demanded by a people of high standards of living and expanding industrial life. The war period, 1914 to 1920, saw a continued increase in United States exports. The increase was due not only to the demand for war materials by the Allies but new markets were created for American goods in countries chiefly supplied before the war by Europe.

Imports on the other hand increased less slowly since Europe, always the main source of our imports, was bending

all her energies to producing for the war. The war period, therefore, built up an export trade balance of enormous magnitude, the excess of exports alone in 1919 being as great as the total trade, exports and imports, in 1913. This excess export balance was much more than enough to pay for all visible and invisible charges, including interest owed by Americans to Europeans; it even was more than sufficient to pay off the debts that had accumulated during the period of United States industrial and agricultural expansion. Why, then, was it possible to continue to export such enormous surpluses? The answer is that the United States Government and United States business men granted credits or loans to foreign governments and foreign individuals. These loans, largely represented by the large excess of merchandise exports, changed the United States from a debtor nation to a creditor nation.

What have been the consequences of this changed position on imports and exports? And what may be expected to be the ultimate effects? Following 1920, there was at first a large decline

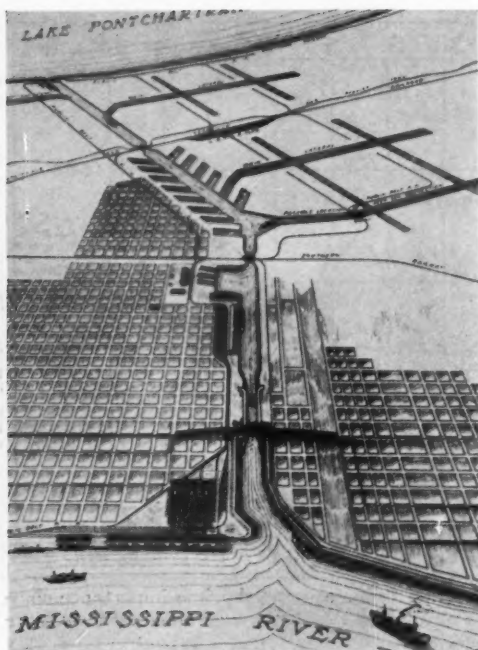


FIGURE 5.—The Inner Harbor Navigation Canal has been an important factor in making New Orleans one of the foremost United States ports; the growth of the port business at New Orleans bids fair to rival that of the Atlantic seaboard cities. (Courtesy of New Orleans Chamber of Commerce.)

in the value of exports, but a much less decline in imports. In 1924, imports were 50 per cent greater in volume than in 1910-14 and materially larger than in 1920. Exports, on the other hand, continued to decline from the high point in 1920 until 1923. There was an increase in 1924 over 1923, but even in that year

exports were only 26 per cent greater than the pre-war average of 1910-14 and much less than in 1920. That is, imports in the post-war years have continued to expand in quantity and are of decidedly greater importance in our trade, both absolutely and relatively than before the war. The export surplus consequently also has declined, although there was an increase in 1924 over 1923.

The export balance continues large at the present time (1925) chiefly for two reasons: 1st, loans and investments continue to be made by Americans in foreign countries; 2nd, payments on United States Government loans to foreign governments are not yet being made in any important degree except on the part of Great Britain. Nevertheless, it must be only a question of time before the relation of exports to imports again changes. With the payment of interest, dividends and principal on these loans and investments an import excess must be expected. Continued lending and reinvestment of interest and dividends in foreign enterprises may postpone, but it cannot prevent, an ultimate overturning of the trade balance, if payments of interest, not to mention repayments of principal, are to be required.

Considerations other than those of interest payments would also further tend to favor the future expansion of imports in excess of exports. The recreation of an American mercantile marine, the up-building of international



FIGURE 6.—The river front in New Orleans is one of the busiest port scenes in the world's trade. The wharves and docks, though of great extent, are crowded with the fleets of vessels that make the city one of their ports of call. (Courtesy of New Orleans Chamber of Commerce.)

banking and insurance facilities, the development of international trading houses, all these mean that the United States has less to pay and more to receive for such services,—services for which before the war we were almost entirely dependent upon foreign countries. Furthermore, the restriction of immigration may be expected to lessen the amounts of immigrant remittances, and hence reduce the necessity of merchandise exports by that amount. This later may be offset by increased expenditures of American tourists.

The conclusion is inevitable that the import trade of the United States must become of increasing importance relative to our total trade. This does not imply that the export trade must decline. It does mean that imports must increase more rapidly than exports and ultimately surpass them in value in order that interest and profits on American investments in other countries may be made available in this country. Not only is the growth of imports inevitable, but it is desirable. It is one of the conditions that makes possible the continued expansion of our export trade. Under the existing conditions, unless imports increase exports must decline. Not enough gold is available in foreign countries to allow foreign bankers to make payments in that metal; payments can be made only in small part through

services; our exports must be paid for mainly in goods, that is, in merchandise imports. Being a creditor nation is, of course, an indication of national strength and prosperity. It gives to a people a greater command of goods and services and hence makes possible a standard of living not otherwise attainable.

THE COMMODITY CHARACTER OF THE IMPORT TRADE

The commodity character of the import trade and the broad changes that have taken place in its composition are shown in Table II.

It is at once apparent that the relative importance of two of these great groups of commodities, Crude Materials and Manufactures, materially changed between 1850 and 1914. The foodstuffs group has fluctuated in importance but shows less regular and marked changes than the two other groups. Crude materials were steadily increasing in importance up to the outbreak of the Great War, until in the five-year period ending with 1914 they constituted 34.4 per cent of our total imports as compared with 32.2 per cent in the first five years of the century and 22.2 per cent in the early nineties. The percentage markedly increased during the abnormal period of the war as was inevitable with imports of manufactures from Europe cut off and production

TABLE II
MERCHANDISE IMPORTS BY GREAT GROUPS OF COMMODITIES
(Millions of Dollars and Per Cent of Total Imports)

Yearly Average	Crude Materials		Food Stuffs		Manufactures	
	Millions of Dollars	Per Cent Total	Millions of Dollars	Per Cent Total	Millions of Dollars	Per Cent Total
1850-54.....	16	6.8	52	22.3	162	70.4
1855-59.....	31	10.2	89	29.8	180	59.7
1860-64.....	37	13.4	86	30.5	154	55.4
1865-69.....	41	11.0	121	32.8	204	55.5
1870-74.....	76	13.7	190	33.8	285	51.0
1875-79.....	72	15.5	192	41.3	193	41.4
1880-84.....	126	18.4	231	33.8	316	46.1
1885-89.....	139	20.7	218	32.3	306	45.4
1890-94.....	176	22.2	290	36.4	323	40.6
1895-99.....	195	27.1	234	32.5	284	39.6
1900-04.....	296	32.2	234	25.4	383	41.8
1905-09.....	419	33.3	299	23.8	529	42.1
1910-14.....	580	34.4	397	23.5	696	41.3
1915-20.....	1270	39.4	919	28.5	1013	31.4
1921-24.....	1156	35.5	806	24.8	1274	39.1



FIGURE 7.—The trade of the world was expedited and facilitated by the cutting of the Panama Canal. The bulky freight that passes through the canal in tramp bottoms and regular lines is at present chiefly of mineral products, though merchandise of all kinds constitutes the aggregate cargoes. This large passenger steamer being towed through Culebra Cut, illustrates the effect of the canal upon travel routes as well as upon trade. (Courtesy of W. R. Grace & Co.)

of manufactures in the United States stimulated. Since the war raw material imports have come to occupy a slightly higher relative position than before the war. Although in actual values crude materials are much greater than ever before, apparently the pre-war tendency to a slow and steady increase in the percentage importance of this group is being maintained.

The manufactures group shows the opposite tendency, that is, a generally slow but constant decline in percentage importance during the last 75 years. Between 1900 and 1914 the percentage changed but slightly, from 41.8 per cent to 41.3 per cent. During the war and the first post-war years, however, manufactured imports amounted to only 31 per cent, the lowest in the history of our trade. Since 1921 the group has again come to occupy a position slightly lower than in 1910-14, apparently continuing the pre-war tendency of slowly diminishing relative importance.

The foodstuffs group of imports, which increased in importance up to 1880 and then declined until the outbreak of the war, was abnormally stimulated by the war. Since 1921 it has assumed a position similar to, but apparently slightly more important than, pre-war.

It is thus apparent that the import trade of the United States, as measured by these groups of commodities, has on the whole changed but little in character as a result of the war. Although it has greatly increased in volume, the same general tendencies seem to prevail in the composition, namely, an increasing importance of raw material imports and a slightly decreasing importance of manufactured products. This change is in accordance with what would be expected as population and industry in the United States grew and developed.

If we consider the characteristics of each of the great commodity groups, we note that textile raw materials, which in 1923 accounted for 44.4 per cent of all

TABLE III
RAW MATERIAL IMPORTS: CHIEF COMMODITIES

Commodity	1910		1914		1923	
	Value of Millions Dollars	Per Cent of Group	Value of Millions Dollars	Per Cent of Group	Value of Millions Dollars	Per Cent of Group
Total of Group.....	566	100	632	100	1387	100
Textile Fibers (total).....	160	28.3	225	35.5	616	44.4
Silk—raw.....	65		98		392	
Wools.....	51		53		127	
Cotton.....	16		19		49	
Other.....	28		55		48	
Rubber.....	104	18.3	73	11.5	185	13.3
Hides and Skins.....	112	19.8	120	19.0	119	8.5
Furs—raw.....	16	2.8	9	1.4	80	5.7
Oil Seeds.....	9	1.5	12	1.9	68	4.8
Tobacco, manufactured.....	28	4.9	35	5.5	57	4.1
Petroleum—crude.....	...	...	12	1.9	54	3.9
Ores—copper, iron, etc.....	27	4.7	33	5.2	52	3.7
Pulp Wood.....	6	1.0	7	1.1	13	1.0
Paper Stock.....	5	.9	9	1.4	14	1.0
Coal.....	4	.7	4	.6	12	.9
Cabinet Woods.....	5	.9	7	1.1	10	.8

raw material imports, is the most important item in the group and that the rapid increase in the value of one raw textile fiber, silk, has been chiefly responsible for the increasing importance of raw material imports in recent years (Table III).

For the most part the leading raw material imports are non-competitive tropical products or products of relatively small importance in the export trade. Cotton imports are not an exception, since the bulk of the cotton imported is long staple, chiefly Egyptian cotton. Tobacco imports are special quality tobaccos from Cuba and the East Indies.

Tropical products make up a very large proportion of imported foods (Table IV). Sugar accounted for 42.5

per cent in 1923, even more important than in pre-war years. Sugar, coffee, cocoa and tea constituted 70.7 per cent of all food imports in 1923, as compared to 61.4 per cent in 1910. In spite of the growing importance of tropical food products, there has been a tendency for the increased import of competitive temperate zone farm products in recent years, such as dairy products of all kinds, egg products, grain and flour, fresh fruits and meats.

Imports of food products exceeded exports by over \$53,000,000 in 1923. This reversed the usual large excess of food exports which averaged over \$25,000,000 from 1910 to 1914, and \$180,000,000 from 1905 to 1909. This situation is the result of the declining export trade in foodstuffs rather than a dis-

TABLE IV
FOOD STUFF IMPORTS: CHIEF COMMODITIES

Commodity	1910		1914		1923	
	Value of Millions Dollars	Per Cent of Group	Value of Millions Dollars	Per Cent of Group	Value of Millions Dollars	Per Cent of Group
Total of Group.....	326	100	476	100	893	100
Sugar.....	106	32.5	101	21.3	380	42.5
Coffee.....	69	21.2	111	23.3	190	21.2
Cocoa.....	11	3.5	21	4.4	34	3.7
Tea.....	14	4.2	17	3.5	30	3.3
Fruits.....	24	7.4	34	7.1	44	4.9
Butter and Cheese.....	7	2.1	13	2.7	29	3.2
Fish.....	...	...	...	...	27	3.0
Grains.....	3	.8	20	4.1	23	2.5
Nuts.....	13	3.8	20	4.1	25	2.8
Spices.....	...	...	5.5	1.1	14	1.5
Olive Oil.....	...	...	8.0	1.7	13	1.4
Sausage Casings.....	...	...	3.0	.6	13	1.4

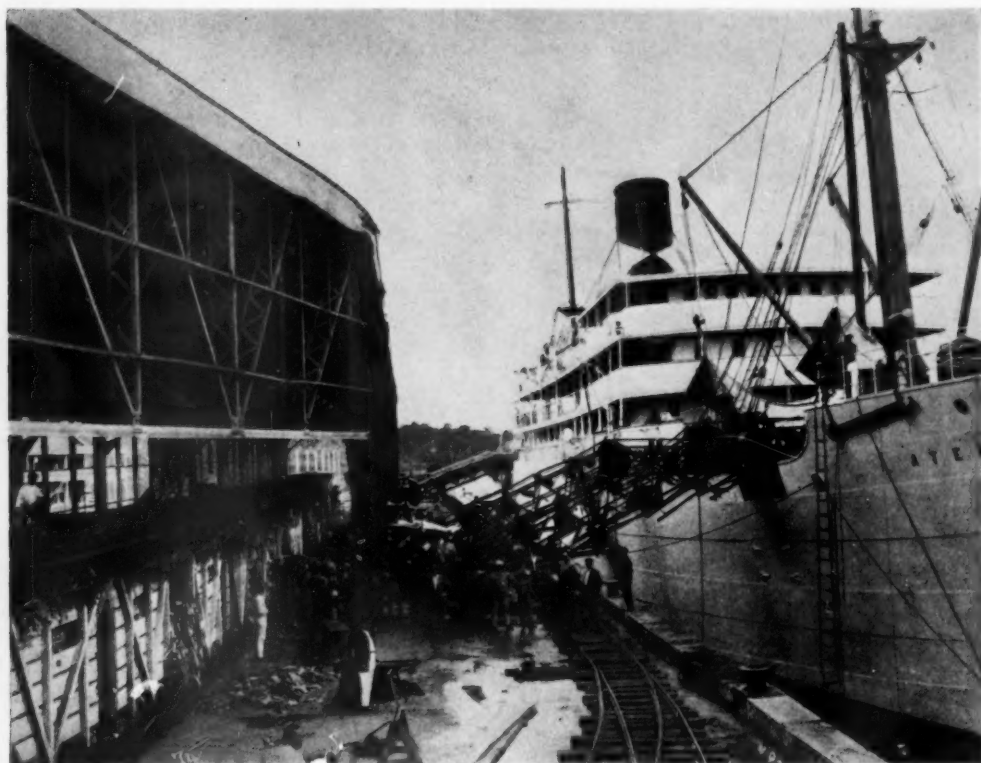


FIGURE 8.—Transferring bananas from freight cars to steamer by modern conveyors at Almirante, Panama. The fruit trade has grown almost magically in the last quarter century. (Courtesy of the United Fruit Co.)

proportionate increase in food imports. Foodstuff importations have kept pace with the increase in total imports, while food exports have increased less rapidly than all exports, or have actually declined. The United States is consuming a constantly larger proportion of its own food production.

Among the imports of manufactured products, textiles are of outstanding prominence, comprising nearly one-quarter of all manufactured imports in 1923. And textile imports have been increasing more rapidly than the manufactures group as a whole. The increase has been greatest in jute and hard fiber



FIGURE 9.—Two sugar boats moored alongside Preston wharf, Cuba, receiving cargo. Sugar is one of the important commodities of United States trade. (Courtesy of United Fruit Co.)



FIGURE 10.—Despite its peripheral location far to the eastward of the center of population and industry, Boston has commanded a large commerce because of its excellent harbor facilities. (Courtesy of Boston Chamber of Commerce and Fairchild Aerial Surveys.)

textiles, and, since the war, in artificial silk.

Second in importance to textile imports are imports of metals,—refined and unrefined copper; brass; tin in bars; blocks and pigs; pig iron and semi-finished iron and steel, steel rails and structural steel; ferro-manganese and the other ferro-alloys; aluminum; zinc; antimony; etc. These are, for the most part, materials for further manufacture. It is significant that imports of these metals ready for consumption are relatively small. While the United States is a large producer of most of these metals, our large manufacturing industry requires much in addition. Since ores are bulky to import, much of metal imports are in the form of smelted, refined and semi-finished products rather than as crude ores.

Paper, principally newsprint paper, is the third important manufactured commodity imported. This import has very

rapidly expanded in recent years as the forest resources of the country have declined. Newsprint paper is in fact the largest single manufactured import. Along with the import of paper the import of wood pulp has rapidly developed. Chemicals constitute another large item in this group. Chilian nitrate of soda, a basis for other industries, accounts for two-fifths of the classification. Chemical imports are of much less relative importance than before the war, reflecting the development of the American chemical industry. Vegetable oils and petroleum products are imports that have largely increased since the war. While the extent and variety of imports are very large, apparently the tendency is toward a greater proportion of those manufactures which are actually raw materials for further fabrication or for use in industry, rather than for immediate consumption. The tendency is readily determined statistically.



FIGURE 11.—The wharf facilities of Seattle are one of the first concerns of the city. As the trade of the port expands the docks are extended well in advance, assuring the adequacy of terminal facilities. (Courtesy of Pierson Photo Co.)

GEOGRAPHICAL DISTRIBUTION OF THE IMPORT TRADE

Except for the period of the Great War the chief source of United States imports always has been Europe. Before the war approximately 50 per cent of all imports was from that continent, although the percentage had been slightly declining during the twenty years preceding 1915. Imports from Asia and Oceania, which had accounted for about 16 per cent of the total pre-war import trade, had been slightly increasing before 1914. The trade with the other Grand Divisions had remained for many years essentially the same in percentage distribution although the absolute increase had been large. During the war Europe fell to second and even to third place as a source of supply of imports, but since 1920 that continent has again regained first place.

However, during the post-war period Europe has accounted for only slightly over 30 per cent of the trade as compared with 50 per cent before the war. Imports from the Far East, on the other hand, have increased to an average of 27.5 per cent since 1920, as compared with 16 per cent pre-war. Imports from North America, *i.e.* from Canada, Mexico, Central America and the West Indies, have materially risen both absolutely and relatively. South America has remained at the same percentage level as before the war.

A better picture of the sources of imports is given in Table V which shows the import trade by commercial regions. In the pre-war period (1910–1914), Northwestern and Central Europe accounted for 43 per cent of United States imports and three countries in that region,—the United Kingdom, Germany

TABLE V
IMPORT TRADE OF THE UNITED STATES BY COMMERCIAL REGIONS
1910-14 Average 1924.

Region	Millions of Dollars	Per Cent Total	Millions of Dollars	Per Cent Total
<i>Europe: North</i>	743	44.0	948	26.4
Northwest and Central.....	724	42.9	924	25.6
Northeastern and Eastern.....	19	1.1	24	.7
<i>Mediterranean:</i>	126	7.4	203	5.5
Southwest Europe.....	80	4.7	110	3.0
Balkans.....	14	.8	38	1.0
West Asia.....	14	.8	22	.6
North Africa.....	18	1.1	33	.9
<i>Africa: Central and South</i>	4	.3	40	1.1
<i>Far East:</i>	262	15.5	958	26.5
Eastern Asia.....	125	7.4	477	13.2
Southeastern.....	120	7.1	432	12.0
Oceania.....	17	1.0	49	1.4
<i>Northern N. America</i>	119	7.0	402	11.1
<i>Latin America:</i>	435	25.8	1060	29.3
East Coast.....	148	8.8	262	7.3
West Coast.....	36	2.1	128	3.6
Caribbean and Mexico.....	252	14.8	669	18.5

and France—alone made up 35 per cent. In 1924, which is typical of the post-war period, this region supplied only

25.6 per cent of imports and the three countries mentioned only 18.2 per cent.

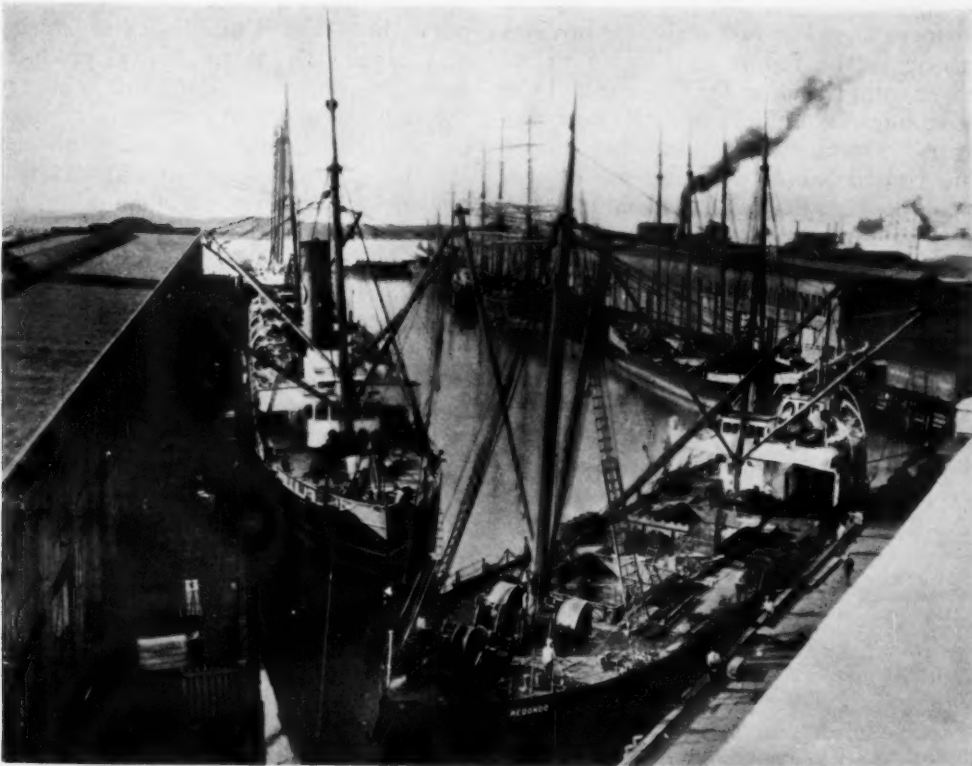


FIGURE 12.—The Seattle terminals which handle much of the hundred million dollar commerce with Alaska, to which Seattle is the gateway, and a large part of the trade with the Orient are modern and commodious, and yet often crowded. That Seattle will become the port metropolis of the Pacific is the ambition and promise of her enterprising population. (Courtesy of Frank H. Norwell.)



FIGURE 13.—The metropolitan section of New Orleans, a gulf port destined to become a major southward outlet to the great agricultural interior of North America. (Courtesy of New Orleans Chamber of Commerce.)

The reasons for the post-war decline are several. The first and most obvious reason is the failure of Europe to recover from the effects of the war and the economic instability of the post-war years. Germany's failure to supply the United States with imports is particularly conspicuous. Germany is the only country of importance that has furnished us less imports even when measured in dollar values than before the war. Another reason for the decline in imports from Europe is found in the increasing growth of raw material imports into the United States and the falling importance of manufactured imports, as noted in the preceding section. Even if other conditions had remained the same, this factor would have meant a percentage decline in imports from Europe. During 1910-14 Europe supplied 79.5 per cent of finished manufactures and 64 per cent of the semi-manufactures imported; in 1923, 60.5 per cent of finished goods and 41 per cent of semi-manufactures.³

Still another reason for Europe's relative decline in the import trade

is the development of direct imports into the United States during and since the war. Many products formerly imported into this country through the entrepôt centers of Europe, particularly London, Amsterdam and Hamburg, now come directly. Commodities like rubber, tin and wool which were brought in large quantities to London for resale and were recorded in our statistics as imports from England, now appear in larger part as from the countries of original production. Vegetable oils, tea, coffee, spices, tin, and many other products are similarly affected.

Hence some of the increase in imports from non-European countries is more apparent than real. For example, in 1914, out of a total import of crude rubber amounting to 131 million pounds, 71 million pounds came from Europe; in 1923, out of 692 million pounds, 81 million pounds came from Europe. In the case of tin, 58 million pounds out of 100 million pounds imported came from Europe in 1913, while in 1923 only 26 million pounds out of 154 million pounds were from Europe. However many commodities continue to come through

³ Trade Information Bulletin, U. S. Dept. of Commerce No. 332; p. 26.



FIGURE 14.—The trade of the lonely, snow-covered arctic empires is carried on almost exclusively by sledge and dog team in winter, by canoe or kayak in summer. The airplane promises to furnish the polar transport of the near future. (Courtesy of the Fur Trade Review.)

the entrepôt ports. For example, Sumatra tobacco, now comes to the United States through Holland as before the war, although during the war a large direct importation was done.

In fact, in many cases where the pre-war entrepôt trade was disturbed by the war, the trade has again shown a tendency to seek the old channels. Entrepôt trade has gradually increased since 1920, although it is still below pre-war levels in relative magnitude. The advantages of world distributing and marketing centers are so strong in

the case of many commodities, particularly those commodities that are not readily sold by grades or standards, and for those produced in scattered centers and which require assembly, sorting and grading in a central locality, that the indirect trade of this nature is likely to remain important. Tobacco, wool and spices are illustrative of such commodities.

Imports from the countries surrounding the Mediterranean Sea account for only a small per cent of imports and most of this trade is from Spain and Italy.



FIGURE 15.—A shipment of 14,000 furs awaiting export from Rampart House, Y. T., to the London market. Throughout the history of trade, the romantic part played by furs in stimulating and exciting exploration, conquest, and settlement, has formed one of the most thrilling threads of interest. (Courtesy of the Fur Trade Review.)

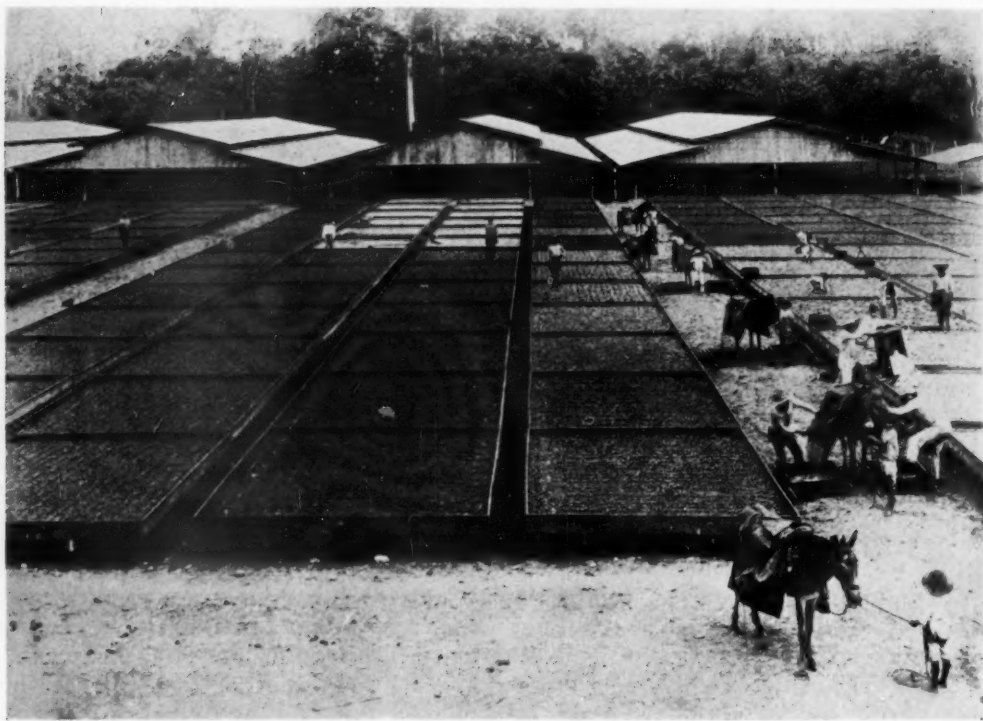


FIGURE 16.—Drying cacao under the equatorial sun in Ecuador. Cacao constitutes one of the major export products of tropical agriculture. (Courtesy of W. R. Grace & Co.)



FIGURE 17.—The development of the demand for bananas among the peoples of temperate lands gave rise to the banana industry, the source of one of the most important commodities in tropical trade. The low coastal plains of the Caribbean lands offer many such scenes as this. (Courtesy of United Fruit Co.)

Many Mediterranean imports, such as dried and citrous fruits, are directly competitive with American products and have been adversely affected by high tariffs in the United States. Prohibition has also affected materially imports from the western Mediterranean.

Far Eastern imports have increased more rapidly than from any other trade region, particularly from Japan, India and the East Indies. Many commodities enter into this increase, but raw silk imports from Japan, rubber and tea from the East Indies, jute and jute products from India, account for much of the gain. In 1923, the Far East supplied 50.6 per cent of the total imports of raw materials, as compared with 25.9 per cent in 1910-14. Two-thirds of the imports from the Far East are crude raw materials.

Imports from Canada have been very rapidly increasing in response to the growing demand in the United States for raw materials and foodstuffs and because of the nearness of Canada to our consuming markets.

Latin America, including all of the Americas south of the Rio Grande and the Gulf of Mexico, was the source of nearly 30 per cent of all imports in 1923. But it should be noted that a very large part of this trade was from the near-by countries bordering the Gulf and the Caribbean. Mexico and Cuba alone supplied to the United States half of the Latin American imports. Here, as in Canada, are to be noted the effects on our import trade of geographical proximity combined with the increasing demand in this country for foods and raw materials as industry expands and some of our own resources approach exhaustion. Sugar, tropical fruits, tobacco and petroleum products account for much of the imports from Middle America.

Foods,—principally coffee and cocoa,—and raw materials,—hides and skins, flaxseed, wool, quebracho,—account for the bulk of the East Coast South American trade; and minerals,—nitrate of soda, iron ore, copper, tin,—are the

dominant imports from the West Coast. Fifty per cent of all crude foodstuffs imported into this country come from the continent of South America. The value of United States imports from Latin America is much in excess of the exports to Latin America. That is, the region is more important to the United States as a source of supplies than as a market. This situation, however, may well be a potent factor in maintaining and up-building the export trade.

It is apparent from the preceding discussion of the geographical distribution of imports that a very considerable, and apparently a growing, proportion of American imports are from the Tropics. Just what percentage of imports are tropical cannot be determined, since many products are not imported directly, but through the large entrepôt centers as Hong Kong, London, Amsterdam and Antwerp. Other products, for example, tea and tobacco, are produced both in the Tropics and outside and it is impossible in all cases to segregate the one from the other in the import statistics. Minerals also, come under this head.

We may, however, determine from the import statistics with considerable accuracy direct importations from tropic regions. In 1913-14, of our total imports, over 28 per cent were from tropic lands, and in 1923 over 34 per cent. This must not be taken, however, as certain evidence of an increase in tropic imports. The increase in direct importations which has taken place since 1914 has especially affected products from the tropics, which have heretofore been accustomed to reshipment in the European entrepôts. Furthermore, the temporary post-war decline in the percentage of imports from Europe raises the percentage of imports from other regions without indicating a permanent increase in the importance of those regions. A considerable proportion of the recent increase in tropic imports can be attributed to the increase in both the tonnage and the price of sugar.

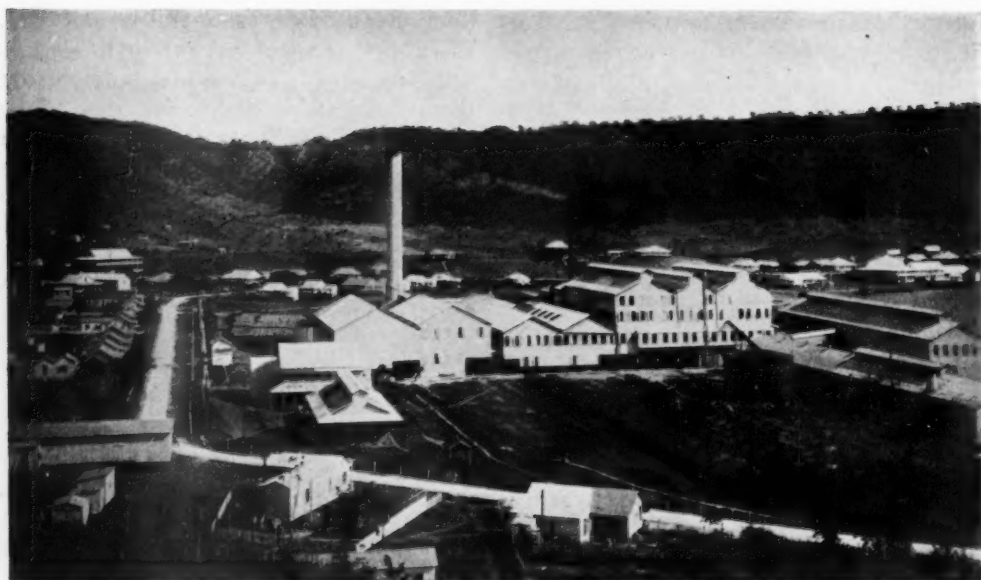


FIGURE 18.—The sugar industry of Porto Rico furnishes the chief export commodity of the American possession. Such "centrals" as this represent the capital required to establish and maintain the industry. (Courtesy of United Fruit Co.)

It is to be expected, however, that with the increasing importance of raw material and food imports, imports from the Tropics might increase relatively rapidly, since most tropic products are not directly competitive with our own crops, and the tropic areas contain large areas open to exploitation for raw material production. On the other hand, the problems connected with the development of the Tropics to the point where the rate of growth of tropic production will outstrip the rate of growth of production in temperate zones are very serious problems and problems extremely difficult to solve.

Furthermore, the low standards of living, and the unprogressive character of the people make the Tropics a region of limited demand for world products. One of the strongest incentives to developing export surpluses, namely, the desire to buy goods in return, is thus absent from the hot lands. Nor is there much promise that an energetic population of high living standards will soon develop in the tropic countries, even with improved living conditions.

IMPORTS INTO THE UNITED STATES BY PORTS AND CUSTOMS DISTRICTS

Into what sections of the United States are imports brought? To a much greater extent than in the case of exports, a few ports receive and distribute most of the imported merchandise. The New York Customs District, which is essentially the port of New York, has long dominated the import trade.

While this dominance has slightly decreased in recent years, with the expansion of trade, nevertheless the New York district continues to receive nearly 50 per cent of all imports. It is one of the characteristics of the import trade in all parts of the world that it tends to be concentrated into a relatively few centers, whereas exports seek a greater diversity of ports for shipment. Exporting is more likely to take place in those ports nearest the places of production. Imports on the other hand are more influenced by the drawing power of marketing centers. New York, being the great marketing center of the United States, naturally, therefore, attracts imports. In addition, New York is near



FIGURE 19.—One of the luxuriant coconut groves that grace the shores of the Caribbean and contribute their yield to the export trade of the tropics. (Courtesy of the United Fruit Co.)

the center of the great industrial region of Northeastern United States where the consumption of imported goods is heaviest. Hence not only do imports of finished manufactured products and foodstuffs reach New York, but also

raw materials and manufactured products for further use in manufacturing make largest use of this port of entry.

The importance of New York as an import center is even greater than the statistics indicate, since a considerable



FIGURE 20.—Loading quebracho logs along the Parana River for transportation to the great industrial centers of the world. Quebracho has but recently become a significant commodity in ocean trade. (Courtesy of Pan-American Union.)

part of the imports attributed to the Interior Districts and to the Northern Border Districts actually come via New York, and a large proportion of the entries at Northern Border cities are destined for New York.

The statistics for imports, as given in the official trade returns, are for customs entries; that is, they are credited to that customs district in which the goods pass through the hands of the United States customs officials, not to the port or district through which the goods actually physically enter the country. Merchandise entered in interior cities, or overseas imports entered in cities not seaports, are necessarily transshipped from some border city to the port of customs entry. A very large share of such transshipment is from New York. Furthermore a considerable part of the goods entered through Northern Border cities, particularly the St. Lawrence district, are goods on their way to New York. Much of the large value of imports via the Northern Border cities is raw silk shipped overland from Pacific ports on Canadian railways and crossing the boundary at Ogdensburg and other cities on its way to the silk marketing and warehousing center in New York.

Raw silk is the largest single import in value that comes to the United States, constituting from 9 per cent to 11 per cent of all imports by value. Being of very high value in comparison to its bulk, it is transshipped at Pacific ports, both American and Canadian, for express rail transportation across the continent to New York. Hence much of the silk technically entered at Seattle and San Francisco, as well as at Canadian border districts, is little more than

transshipment trade destined for the actual silk importing center of the country in New York City and its vicinity, where nearly all raw silk is marketed and manufactured. Raw silk represented 77.2 per cent of all imports into the Washington district (Seattle) in 1913; 37.1 per cent of the imports into San Francisco; and 54.5 per cent of the imports across the St. Lawrence border.

More than two-thirds of all imports are entered through Atlantic Coast ports. Including Gulf ports, Northern Border ports, and interior districts, it is probable that between 85 per cent and 90 per cent of all imports enter directly the eastern half of the United States. In addition, a very considerable proportion of Pacific Coast imports, as we have seen, are for immediate shipment to the eastern seaboard. Seattle, which was second to New York in the value of imports in 1924, owes the rapid increase primarily to raw silk, a commodity of very high and rapidly increasing value but of relatively small bulk.

Large population, extensive industrial development, organized marketing centers, and accessibility to the chief sources of our import trade in Europe, middle America and Canada account for the continued dominance of Atlantic and Gulf cities as import ports. With the improvement of port and marketing facilities in the South Atlantic and Gulf states, and with the increase of population and industry in the South and Far West, it must be expected that New York's percentage of imports will decline. That it will long continue, however, to dominate the import trade of the country seems likely.

THE LANDES: RECLAIMED WASTE LANDS OF FRANCE

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EXTENDING seaward from the Garonne in the triangular area enclosed by that stream and by the waters of Biscay and of the Adour-Midouze Rivers lies a vast sandy plain known as the Landes.¹ Formerly a desolate waste it is today one of the prosperous regions of France and one of the few sections where the rural population is actually increasing. The story of its transformation is but another chapter in the history of the struggle between man and his age-old rival—the sea. Though not so well known nor so spectacular as the work of the Dutch, the reclamation of the Landes is a most excellent illustration of a nice adjustment of human activities to a most exacting and difficult environment.

THE LANDES OF TODAY

Westward bound from Bordeaux after some three or four miles of the ubiquitous vineyards, the train plunges abruptly into the great forests of the Landes (Fig. 1). To the American traveler the impression is that of passing through a great park. Tall straight pines in all stages of growth, the older ones with trunks trimmed to a height of fifteen or twenty feet, the ground covered with ferns but entirely free of underbrush or fallen timber, and almost all made accessible by broad well-paved roads—such is the forest of the Landes (Fig. 2). At fairly regular intervals are fire lanes, and every now and then a small opening with an acre or two of meadow, a patch of corn, rye or potatoes, and a modest French farmhouse, the home of the Landais. For mile after

mile, the scene remains unchanged. Even the villages seem to have been all cast in the same mold. A station, side-tracks bearing train loads of logs, lumber, mine props, pine boughs, barrels of turpentine and resin, with the inevitable sawmill and turpentine still occupying the center of the stage, these with a few shops and some three or four dozen small houses make up the typical urban centers. East, west, north or south, no matter which way the leisurely moving train takes you, the picture is the same. Not till one nears the coast is there a change. Here is to be found the chain of lakes separated from the sea by great ridges and mounds running roughly parallel with the coast—the troublesome sand dunes.

With all its lack of variety, the land has an atmosphere of simplicity and thrift, of sobriety and frugal living. Nowhere are there great mansions, neither are there hovels of the extremely poor. Even the casual visitor feels that modest though substantial prosperity is the lot of these people and that in material wealth this region compares very favorably with much of the rest of France.

THE LANDES OF YESTERDAY

There is scant evidence today of the conditions that prevailed in the Landes a century ago. Then it was a land seemingly accursed by nature and abandoned by man. It was a vast expanse of sandy waste almost as barren, flat and monotonous as the sea itself. To add to the handicap of sterility, the sand at a depth of a foot or two rested upon an impervious layer of hard, black sandstone or "alios," as it is known locally. In Figure 5, it is seen outcropping at the seashore. Thus the flatness of the surface above and the

¹ A natural region including a large part of the department of the Landes, a political unit. In addition it embraces part of the departments of Gironde and Lot-et-Garonne. The name "Lande" means "waste land."

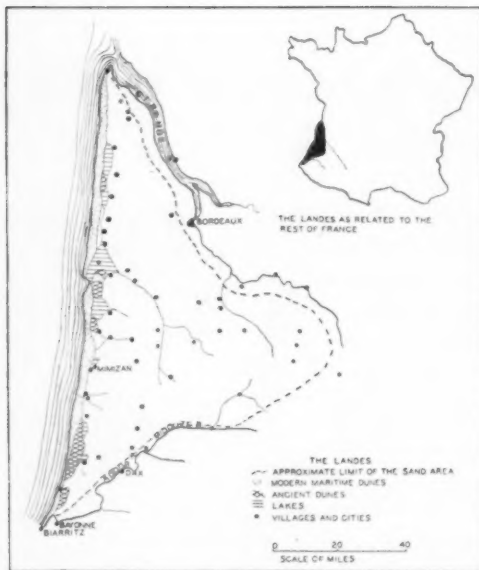


FIGURE 1.—In the Landes of France, the triangular coastal tract between the Adour and the Gironde Rivers, and the Bay of Biscay, the American turpentine industry may find a good example to follow in the application of technical and business principles to the scientific development of the production of naval stores. (Adapted from a map by Edouard and Jacques Harle, *Memoire sur les Dunes de Gascogne*, Paris, 1920.)

existence of this impermeable layer below made both surface and underground drainage extremely poor. As a result the winter rains speedily turned vast areas into marsh and swamp for some three-fourths of the year, while the scorching droughts of summer rapidly transformed it into desert for the remaining quarter. As if this were not enough, the region was notoriously unhealthy, no part being free from malaria.

Under such conditions the population was necessarily sparse, extremely poor, and with an outlook almost hopeless. An occasional patch of pine forest provided a small amount of naval stores. The scattering herbage supported a few half-starved herds of sheep. Figure 6 shows an interesting accommodation to the swampy lands on which the shepherd's progress was facilitated by the use of stilts. Along the coast, fishing villages were to be found then as now. Taken all in all, it was an extremely desolate, discouraging situation—a region shunned alike by man and beast.



FIGURE 2.—The surfaced roads and well-kept trees of the Landes would do credit to many American city parks.

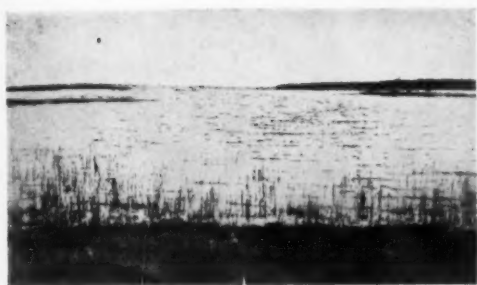


FIGURE 3.—Lake Sangunet. Note the low shores. This is near Mimizan, just east of the dune belt.

To crown all these misfortunes there appeared in the 17th and 18th centuries a new menace to add to the woes of the Landais. Close pasturing had removed the vegetation cover of the dunes and the increased deforestation of the lower Pyrenees had supplied an excessive amount of sand to the littoral currents to be in turn washed up as dune sand. The resulting instability of the dunes allowed of their being drifted, the migrations inland in some cases being as much as 90 feet per year. Once in motion nothing seemed able to check the progress (Fig. 7). Fields, forests, lakes, villages—all that were in their path seemed doomed. The village of Legé

which had been moved about two and one-half miles in 1480 was again compelled to shift some two miles in 1660. Mimizan, on its original site, was an important seaport and a landing place for the Normans. The sites of both town and port were buried under the advancing dunes of sand, and the latter had reached within a few yards of the church of the present village site, when they were checked.

THE WORK OF RECLAMATION

"To the French Inspector General who checked the advance of the Dunes by the Planting of the Pines," thus reads the inscription carved in the base of a memorial statue in the little village of Labouheyre in the midst of the Landes.

It was M. Bremontier who first devised the successful scheme of holding the dunes in place and whose work, followed by that of Chambrelent, was the indirect means of forestation of much of the Landes. The immediate purpose of Bremontier's work, begun in 1787, was the fixation of the dunes. Selecting the youngest dune ridge next the sea a brush rampart was built upon it. As the sand filled in, the barrier was raised and this



FIGURE 4.—Dune de la Grove: Seaward side of dune showing stumps of forest (on top of former dune) later covered by sands and now reëxposed.



FIGURE 5.—Ocean Shore, Gironde, France. "Alios" (hardpan) over a meter thick outcropping just above sea level. Gourbet grass planted on dune in background.

procedure repeated until the height became so great that the sand ceased to cross over. Gourbet, a beach grass, was

then planted, as shown in Figure 8. When this took root the sand became sufficiently stabilized for the seeds of a



FIGURE 6.—The Shepherd of the Landes on stilts. A picturesque figure now seldom seen except in the most isolated portions.



FIGURE 7.—Dune de la Grove moving over a forest. Larger trees cut to save them from the sand.

native rapid-growing pine to catch, and with the trees firmly established the dunes were definitely fixed. With this accomplished the forestation of the other dunes to the rear, as in Figure 9, was comparatively easy. In this fashion the whole dune littoral covering an area of some 400 square miles was forested by 1865 and the Landes made safe from their inroads.



FIGURE 8.—Mimizan Plage: Top of shore dune with protective wicker work and planted with Gourbet.

The fixation of the dunes, in itself a notable achievement, had, as suggested above, another and a hardly less important effect. The success of dune planting gave an impetus to the forestation of the whole Landes.² Drainage and pine planting under government encouragement progressed, not, however, without considerable opposition, until 1892, approximately 2,000,000 acres had

been planted and the major part of the Landes had become a vast pinery.³

THE TURPENTINE INDUSTRY

Though transformed from a waste to a forest, the rigid limitations of the soil have left the Landes a region of essentially a single resource. Practically every one of its 1,400,000 inhabitants is largely dependent directly or indirectly upon the pine forests. Grim necessity

² Portions of the Landes have become famous health resorts attracting some 200,000 visitors yearly.

³ In the extreme southeast the cork oak is used instead of the pine (see Fig. 10).



FIGURE 9.—State Forest of Cazaux: Basket work of stakes and brush put in to check drift of sand.



FIGURE 10.—Cork-oaks in the extreme southwest of the Landes replace the pine. The trees shown have been stripped. Note the fern undergrowth.

has, under these circumstances, forced them to develop a system of timber growth and exploitation which would insure them a reasonably certain and continuous support. That they have succeeded, the picture of a contented, prosperous population as described above in "The Landes Today" bears ample evidence.

The "farm" of the Landes is the pine wood, the "farmer" is the "Resinier" and the "crops" are naval stores and wood (Fig. 11). In the Landes, turpentine is king and other products are of secondary importance. "Rotation" is practiced not by changing the plants grown but by changing the crop gathered from them. The cycle is completed in from 60 to 80 years. During the first 20 to 25 years pruning and thinning provide a small wood crop; for the next 30 to 50 years, except for short rest periods, the trees are cupped and, with the continued thinning, yield both gum and wood. At maturity the remaining trees are cut and the cycle is repeated. By so arranging his acreage as to have a certain proportion of trees at each stage of growth

there is an uninterrupted succession of crops which yield a regular annual income.

The average cost of reclamation and forestation of the Landes has been estimated at \$6.41 per acre, the net annual revenue at \$2.22.⁴ One operator on the Adour reported in 1924 a detailed record of his operations extending over 50 years.⁵ From an original hectare with 625 trees spaced four meters apart and ranging from 15 to 65 years in age, there was obtained through this period an average net income from wood and gum of about \$10.00 per acre.

It should be noted in this connection that over four-fifths of the forest laborers possess holdings of their own either within or near the woods. While the contribution of foodstuffs from the small scattered farms is considerable, the cultivation of the land is made practicable only by reason of the major forest operations. The resinier is free during the

⁴ Greely, W. B., Chief U. S. Forest Service.

⁵ From a table in a Preliminary Report of the Naval Stores Commission based on data furnished by Monsieur L. Poudeux of Pontoux-sur-Adour, Aug. 12, 1924.

slack season, November to February, to work his farm or thin the forest.

The methods used in the production of naval stores in the Landes are in marked contrast to those employed in our southern states. Their efforts are centered upon the growing of timber; ours, with "mining" it. Their system is based upon the idea of a long period of turpentine—30 to 50 years—in such a fashion that the timber value remains practically unaffected. Our trees are bled profusely for 3 to 6 years and the timber is then cut.

The consequences of such contrasting practices are equally marked. In the United States the industry has been constantly on the move in the search for new forests as the old were exhausted. The end of the virgin growth is in sight, second growth is being used, and young trees are being so worked as to preclude their usefulness later. The communities depending upon the industry have likewise been transient, poor, and lacking in substantial growth. The French, on the other hand, have made naval stores

production as stable and dependable as agriculture, supporting in comfort a large population with permanent buildings and well-organized social communities.

The United States has for years produced from two-thirds to three-fourths of the world's turpentine, and still dominates the world market. Unless, however, there is a radical change in our methods the end implied in the expression "a dying industry" often applied to it here will be soon realized. As has been pointed out by the Naval Stores Commission which visited the Landes, the French production has been increasing for some 80 years and until now from only some 2,000,000 acres an output is obtained one-fourth as great as is secured from our entire southern states. With poorer soil and climate, an inferior species of tree, and less capital the Landais have turned a plague spot into a veritable garden and made a production record which in view of the status of the American industry is extremely suggestive.



FIGURE 11.—The "Resinier" at work.

THE GEOGRAPHIC REGIONS OF THE SUDAN

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THE Sudan is the name rather loosely applied to the broad belt of tropical grasslands lying between the Sahara on the north, and the equatorial forests of the Guinea Coast and Congo Basin on the south. It is a truly tropical region with high temperatures throughout the year. The region is under

Man's agricultural activities in the Sudan exhibit a serial transition from tree crop agriculture, through grain farming, to pastoral nomadism, as geographic conditions gradually change from south to north (Fig. 1). Though there is this regular transition in both physical environment and resulting eco-

GEOGRAPHIC REGIONS OF THE SUDAN

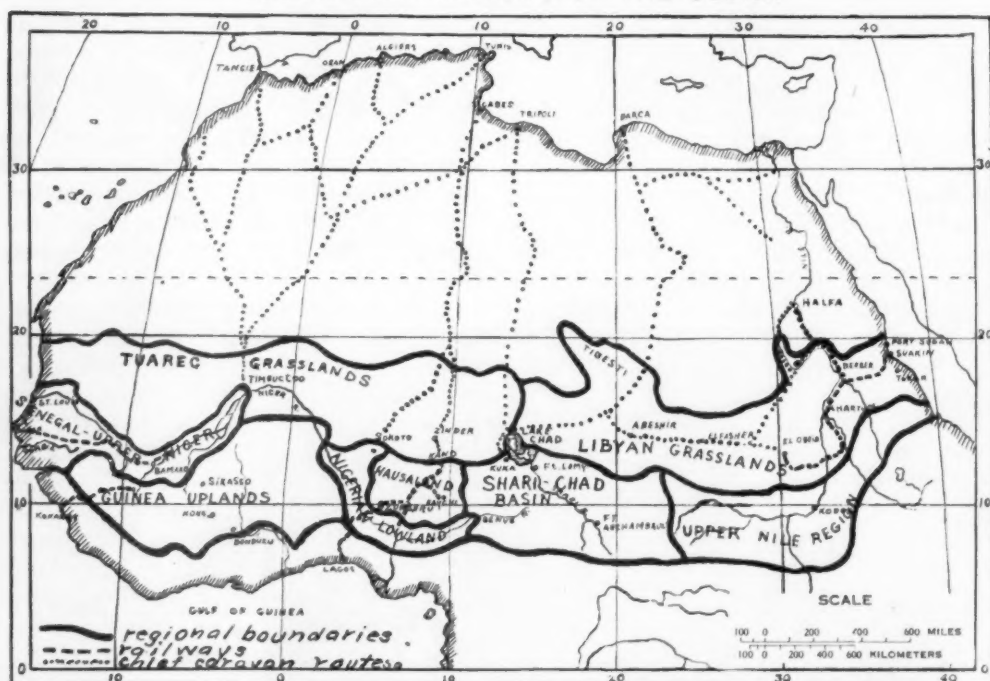


FIGURE 1.—The regions of the Sudan constitute a vast tropical empire, which may become, under the scientific exploitation of its resources by enlightened Europeans, one of the world's greatest sources of raw products.

the influence of the dry winds from the Sahara for the major part of the year but during the summer months, the equatorial rain belt migrates northward and brings to the region a short summer rainy season. The length and vigor of this rainy season decreases toward the Sahara and away from the rainy low latitudes.

conomic life, nevertheless the Sudan can be roughly classified into two zones: the savannahs and the semi-arid grasslands, within which there may be discerned several striking localized features or regional aspects. Let us proceed then to make a tentative regional division of the country into areas, within which some

uniform relationship of man to his environment would seem to exist.

The savannah zone:

- (1) The Guinea Uplands
- (2) The Upper Niger-Senegal Valleys
- (3) The Nigerian Lowlands
- (4) The High Plains of Hausaland
- (5) The Shari-Chad Basin
- (6) The Region of the Upper Nile

The semi-arid grassland zone:

- (7) The Tuareg Grasslands
- (8) The Libyan Grasslands

THE GUINEA UPLANDS

North of the forested Guinea Coast stretches an undulating upland broken here and there by round hills which occasionally rise to a considerable height. This gently rolling country is well watered, the precipitation varying from 80 inches in the south to 25 inches in the north. The temperature and humidity of the rainy season is not unlike that of the forested coast, but the harmattan wind of the dry season often brings temperatures as low as 50° F. The area is covered in the south with coarse grass, often twenty feet high through which are scattered gnarled trees, giving it the appearance of an abandoned English orchard. The grass decreases in height and the trees shrink to a few coppices toward the north.

A group of varied Negro tribes inhabit the area and are engaged chiefly in farming; tobacco, cotton, peanuts and millet are grown everywhere. Guinea fowl are kept in all the villages and wire-haired sheep and goats are universally raised. In the south, cotton, rice, and yams are cultivated. The French have greatly encouraged the growth of cotton with the hope of securing an export, but their efforts to develop the region have met with small success, for epidemics of influenza often decimate the population; rinderpest destroys the cattle and drought frequently ruins the crops. As might be expected, these plagues seldom occur separately.

The Fulani, a light colored race, are the most important people in the region. They predominate in the cattle areas and are slowly filtering into the farming areas to the south, where they become herdsmen in charge of local flocks and herds. The population in the area is perhaps ten per square mile, but a considerable part of it is concentrated in large trading towns such as Kong, Bonduku, and Sikasso.

The trading is largely in the hands of the Mandingoes who are aptly called the "Jews of the Sudan." These merchants bring rugs and fabrics from Timbuctoo and Kano and beyond, as well as manufacture sandals and leather wares, and deal in cotton and metal wares made by native artisans. The Wongara natives conduct the local markets of yams, peanuts, beans, rice and millet meal (Fig. 2).

Besides the agriculture of the region which results in exports of cotton and peanuts in considerable amounts, and stock raising which furnishes exports of hides and skins, there is also a considerable output of palm oil and kernels, shea butter, rubber and kola nuts, a characteristic group of savannah tree crops, some of which are exported, but mostly consumed locally.

Along many of the streams, gold bearing gravels yield a fair annual output of gold, but the relative, if not actual importance of this is decreasing.

THE UPPER NIGER-SENEGAL VALLEYS

The Upper Niger River occupies the great broad lowland north of the Guinea Uplands. This lowland, from Bamako to Timbuctoo, is watered each year by extensive but irregular floods of the Niger and its tributaries. The Niger thus deposits a thin layer of rich alluvium in its valley, much as does the Nile in Egypt. In fact, the French are given to calling this "their Egypt," and are hoping to develop cotton growing here to the point where it will actually rival Egypt as a cotton producer.

Similar areas occur in the Senegal Valley where a strip of alluvial land, 10-15 miles wide, follows the north bank of the river from Karakoro to the sea. This narrow zone of tropical vegetation showing green in the midst of a brown country is called locally the "Shamama." From August to November the floods of the Senegal, overflowing its braided channels, make this a huge marsh. The valleys of some of the shorter coastal streams are subject to somewhat similar conditions.

disease renders the future utilization of the area rather uncertain—80% of the cattle being carried off by the scourge in 1917. Nevertheless the Fulah natives raise great numbers of livestock, sending horses to the areas lying to the south. Considerable exports of hides and skins find their way out to the coast and if some check to cattle disease and pests can be found the region may some day rival the Argentine in sending meat to the growing markets in Northwest Europe.



FIGURE 2.—Transport on the Native Paths of the Guinea Uplands. (Courtesy of Keystone View Co.)

The northern limit of heavy rains in the Sudan lies approximately at the mouth of the Senegal River, hence the grasses of this region are shorter and more nutritious than on the uplands to the south. As this luxuriant grass makes excellent pasture for sheep, cattle, horses, and donkeys, it is here that the great pastoral tribes over developed. But

At present this region is chiefly noted for its production of peanuts and sorghum, but due to the activity of the French, cotton production is increasing on the easily irrigated lands of the river bottoms. Peanuts form by far the greatest portion of the exports, being readily absorbed by the industry of southern France. Four-fifths of the

entire exports from the Gambia Valley consist of peanuts (Fig. 3). Here much of the land is communally held and worked in a primitive manner by native farmers, whose numbers are seasonably augmented by some 20,000 "strangers," who come into the valley for the peanut season, only to return to their native uplands after that crop is harvested.

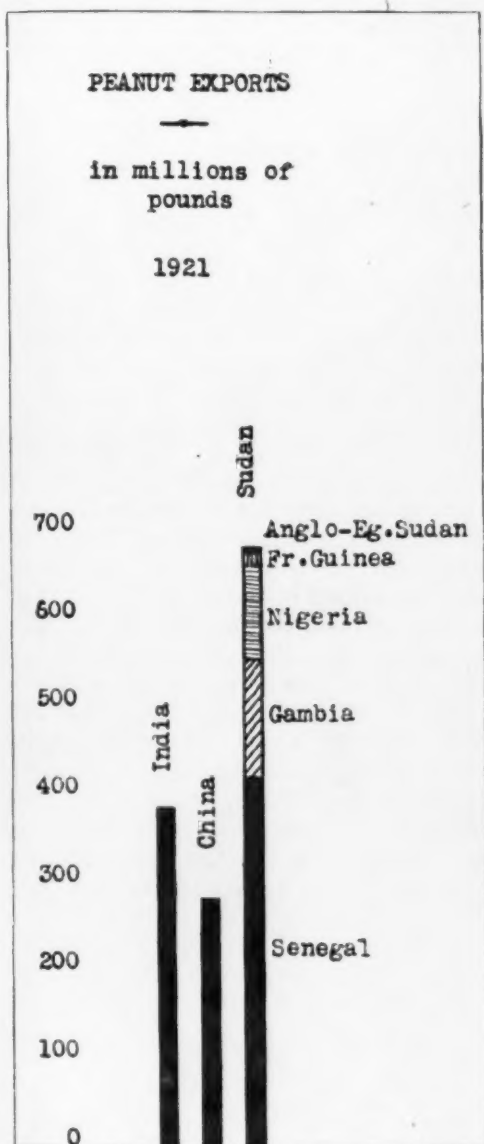


FIGURE 3.—The relative importance of the Sudan in the peanut industry is clearly indicated by this chart.

The Senegal, Gambia and Upper Niger Rivers are navigable for small river steamers and have long been the natural trade outlets for the west Sudan (Fig. 4). The railway which the French have built into the interior from Dakar and St. Louis on the coast promises to make this route a great highway of trade, although much traffic finds its way out to the coast by the short railways to the south (Fig. 5).

THE NIGERIAN LOWLANDS

Lying back of the hills of Southern Nigeria is an exceedingly fertile lowland carved out by the two mighty streams, the Niger and the Benue which, meeting at the little city of Lokoja in Northern Nigeria, form the Lower Niger and flow south through the forest zone to the Gulf of Guinea. In its course through Northern Nigeria, the valley of the Niger is a peculiar succession of narrow sandstone gorges and wide alluvial plains, bordered by low tabular sandstone hills (Fig. 6). The valley of the Benue is a "vast plain, spread out at the foot of the hills. It is a beautiful country, with the sharply outlined ridges in the distance,¹ while the silver loops of the Benue River wind among fertile plains in the foreground dotted with small grass-capped mud huts," which are hidden in the fields of guinea corn of the Yergum, Igbera and Igara tribes. Here and there, can be seen herds of small, humpbacked Fulani cattle and flocks of shaggy goats, for the Fulani are here, keepers of flocks and herds, as elsewhere in the West Sudan.

A view of the drowsy native activity, and the sight of the native women washing clothes in the Benue River, reminds one greatly of the Ganges Valley in India. "The valleys of the Niger and Benue, being only a few hundred feet above the sea, have less rain (about forty inches) but much higher temperatures and humidity² than the uplands;

¹ Karl Kumm, "From Hausaland to Egypt," p. 36.

² W. G. Kendrew, "The Climates of the Continents," p. 38.



FIGURE 4.—A section of the city of Timbuktoo, the focus of the trade of the western Sudan and Sahara since very early times. (Courtesy of French Govt. Tourist Office.)

they are heavily forested in parts and unhealthy." Countless varieties of insect life add to the terrors of the place. In fact, insects are so obnoxiously abundant that the British officials often keep pet toads to help rid them of the pests. This park-like country is naturally very fertile, and so in some places, the Benue Valley is so densely peopled that the villages on the banks of the river are so close together as to make one town, five or six miles long. These villages are often remarkable in that they show the results of intelligent city planning—a thing rather badly needed in far more civilized regions. During the rains, extensive floods occur in these lowlands. The Niger varies from a few hundred yards in width during the dry season, to several miles in the rainy season. The Benue, likewise, varies greatly when in flood. Toward the east, there exist great swampy tracts. In other places, the braided channels of the great stream winds through mud flats, which are punctured with small volcanic mounds.

On these rich lowlands, the Nupes and

other pagan tribes, raise tropical fruits, sugar cane, yams, ground nuts, guinea corn, maize, shea butter and in fact, all of the main Sudanese crops. There are great areas of "cotton soil," and it is here that the efforts of the British to get the native to raise cotton have been most successful (Fig. 7). Already, a regular export of cotton goes yearly to Manchester. This is greatly helped by the fact "that the Niger and Benue are, in themselves, great natural highways,³ and there are, in addition, many good roads (built by the British) running in all directions," and the Lagos to Zungeru railway, as well as the Baro-Kano line. The abundant rain, the richness of the soil, and the excellent transportation of these lowlands, bid fair to make of them, one of the most productive of all regions of the Sudan.

THE HIGH PLAINS OF HAUSALAND

North of the junction of the Niger and Benue Rivers, there is a large plateau

³ Beverly and Kerr, "Geog. of Br. West Africa," p. 148.



FIGURE 5.—Loading a train on the first day of running on the railway recently built into the Sudan by the French. This line runs from St. Louis and Dakar on the Atlantic coast to Kayes far up the valley of the Senegal River. This road forms one of the links in the rail and water route from the coast to Timbuctoo. (Courtesy of Keystone View Co.)

bordered on the south by an escarpment, feet high. To the north, northeast and in places fifteen hundred to two thousand northwest, stretch the high plains of

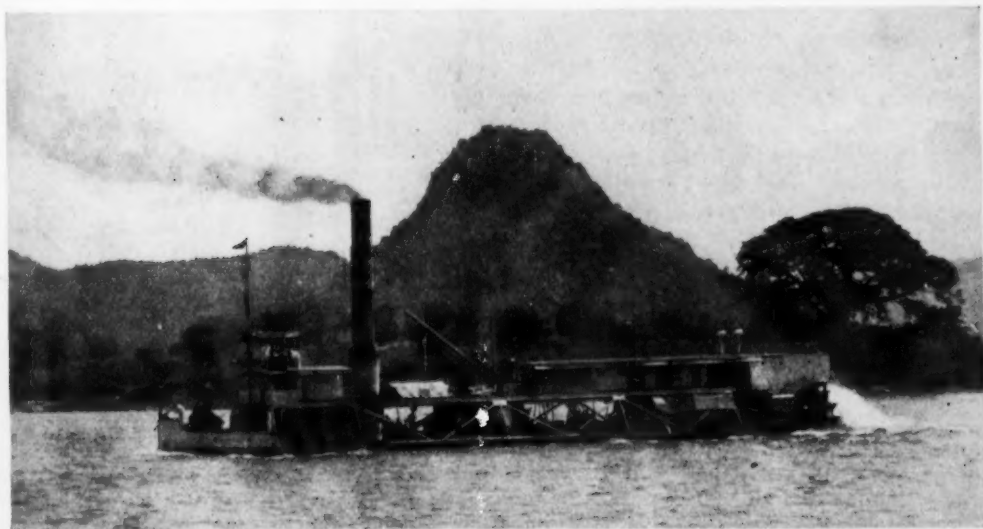


FIGURE 6.—A scene in the Middle Niger-Benue lowlands. River steamer plying from Onitsha to Baro. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)

Hausaland. On the west, these are "open sandy plains, with here and there a "turtle back" or heap of granite boulders." To the east, these granite hills disappear and their place is taken by sandstone hills capped by layers of hard grit. In the south central part of these high plains, there is a higher area of old crystalline rocks known as the Bauchi Plateau, which has a general elevation of 4,000 to 4,500 feet. Rivers radiate in all directions from the plateau, across the high plains, which they have dissected to a large degree.

These high plains or plateaus receive a rainfall of from 20 inches in the north, to 40 inches in the south, and are probably the most healthful part of the west Sudan. Indeed, the higher Bauchi Plateau has a cool bracing climate, most of the year. The natural fertility of this region is great and most of it is cultivated by the Hausa Negroes who inhabit the region. Cotton, peanuts and guinea corn are raised by shallow hand cultivation. As a result the drought years and sharp harmattans frequently ruin crops and cause famines. Yams, onions, tobacco and cassava are frequently cultivated through artificial irrigation by means of the Egyptian shaduf. The cattle industry thrives (Fig. 8).

Upon the higher Bauchi Plateau, much of the land is also under cultivation, but large farms are the rule here, for the yield of guinea corn and millet is rather poor. This higher plateau is dotted with villages and hamlets, clusters of grass huts at the foot of some rock eminence. It is also dotted with the holes of tin mines for large deposits of tin (Fig. 9), as well as galena, silver and bitumin occur here. The Hausas and other people have long known and worked these tin deposits, but under English rule, a new impetus has been given to tin production. In places there is also much good iron ore; crude native furnaces are a common sight. Indeed many parts of the plateau, originally forested have been completely deforested for smelting iron.

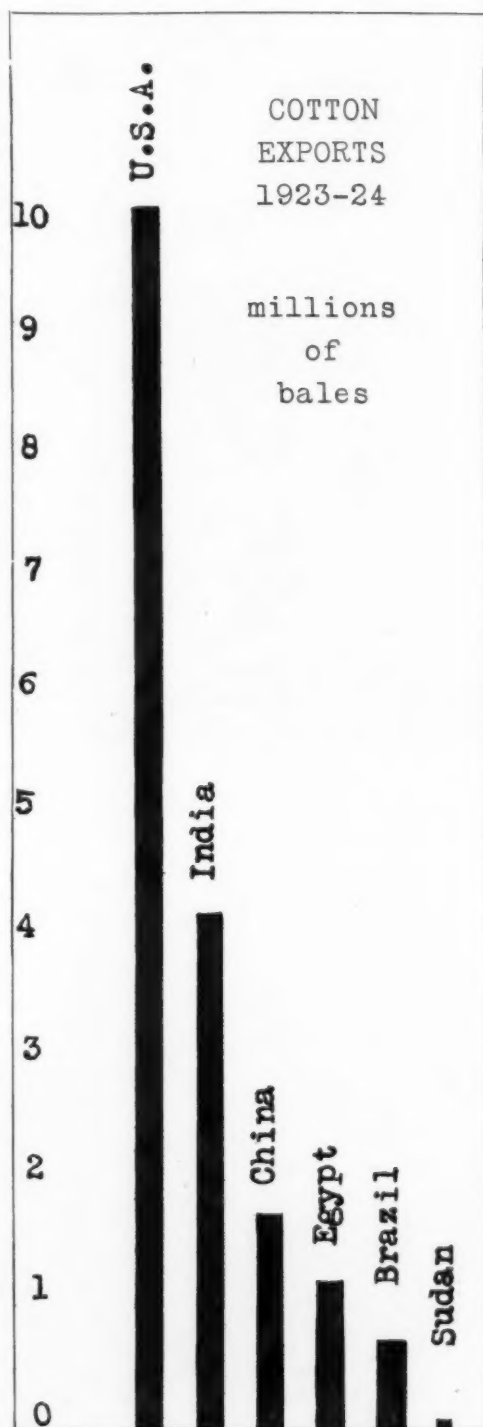


FIGURE 7.—The Sudan cotton industry, though now insignificant is rapidly growing, and bids fair to develop into a serious rival to some of the older cotton growing regions.

**Number of
CATTLE**
—
**in millions of
head**

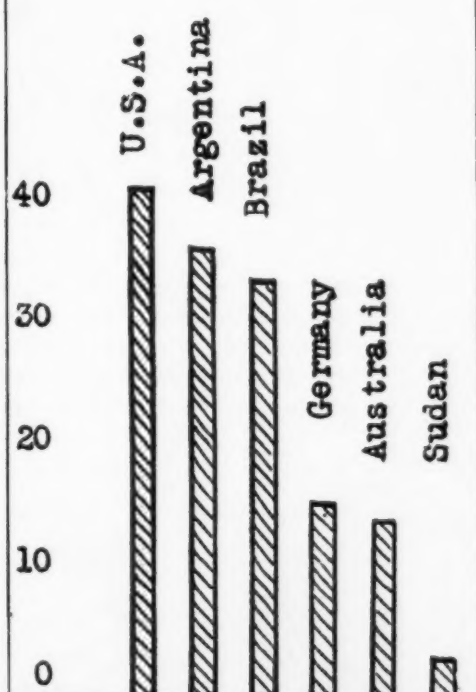


FIGURE 8.—The Sudan cattle industry, like its cotton industry, is in its infancy, but promises to develop into one of Africa's greatest sources of wealth.

Population is here fairly dense and a great number of rather large cities exist. These are the centers of trade and miscellaneous small manufacturing for the whole of West Africa. In fact, cotton weaving has been known here since the eleventh century. The Hausa Negroes of the region have a natural aptitude for trade and their great trading center is Kano, with a population of about 50,000 (Fig. 10), which is often called the

"Manchester of the Sudan." "Its wares are famous throughout a great portion of Africa. Its cotton and leather goods are exported to the Gulf of Guinea and to Timbuctoo, and districts in and beyond the desert. It supplies sandals for half the Sudan and Sahara. Its commodities are sent to Murzuk, and

TIN
World Production 1919
—
**in thousands of
metric tons**

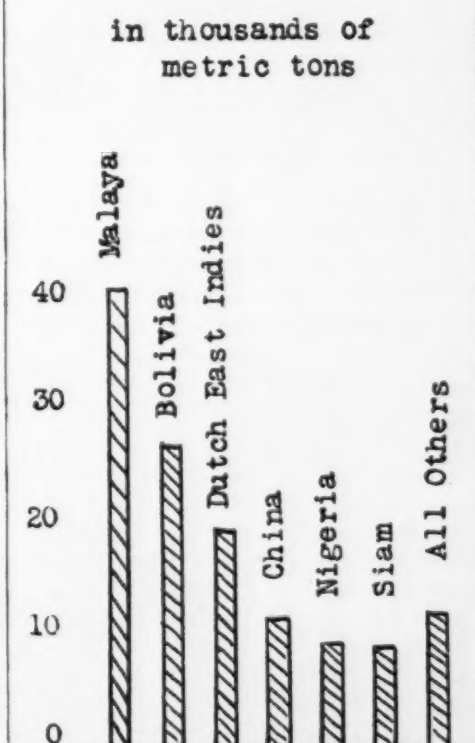


FIGURE 9.—The tin export from the Sudan, though not insignificant, is only a small part of the world's product.

even Tripoli. Great caravans come from every quarter of the Sahara.⁴ The Moors bring articles to Kano (Fig. 11) and compete with Europeans coming up from the coast." The English have

⁴ Jerome Dowd, "The Negro Races," p. 108.



FIGURE 10.—The Emir of Kano and his retainers outside the baked mud walls of Kano. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)

greatly added to Kano's future by building the railroad from Kano to the coast and also by building several good roads. A number of other large cities are important market centers, as well as col-

lecting points for the tin, cotton, peanuts and hides which are being exported to Europe in ever increasing amounts (Fig. 12). This region seems especially promising as a future important source of tin



FIGURE 11.—A caravan train from Zinder arriving at Kano, Nigeria. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)



FIGURE 12.—Native artisans dyeing their cloth in tubs cut in stone. Kano has long been famous for her skilled workers in leather, iron, tin and cloth. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)

and peanuts. The fact that considerable waterpower exists on the Bauchi Plateau as well as extensive coal fields around Udi likewise offers some promise for internal industrial growth (Fig. 13).

THE SHARI-CHAD BASIN

From the Adamawa Highlands in the south to Lake Chad in the north, and stretching from the eastern edge of the high plains of Hausaland clear to the mountains of western Darfur, is a vast lowland plain, usually termed the Shari-Chad Basin. The center of this immense depression is the great shallow Lake Chad.

Much of the area is badly drained so that large areas become swampy during the rains (Fig. 14). The country is for the most part uncultivated grassland, broken only by clumps of trees which here and there stand out as landmarks. In the lower valleys of the eastern part of the region, much cultivated land can be seen, where the Kanuris are growing their guinea corn, yams, oil palms and vegetables (Fig. 15). These Kanuris are a skillful race of Hamitic people with a

Negro substratum. They do considerable manufacturing of cloth, iron, copper and leather goods in their cities, where Moors, Tuaregs and Tibbus collect to market their wares from Tunis, Tripoli, Tibesti and the Saharan Oases.

Besides these agricultural Kanuris there are many Fulani in the region, who on the uplands raise cattle and horses. In many parts of the country, the tsetse fly interferes considerably with the development of livestock industry. Large numbers of the Fulani bring their herds down into the Shari and Chad lowlands, returning every summer, during the rains, to their healthier highlands.

Farther east, the country gradually rises. Hills of sandstone, basalt and graywacke appear, between which are interspersed creeks, meadows and park lands. The natives, Saras, Kabbas and other tribes, are good agriculturists, growing maize, wheat, yams, millet and manioc, besides keeping poultry, goats and sheep. The ivory and rubber which they gather constitute most of their merchantable produce. Fort Archambault is the trade center of the eastern part of

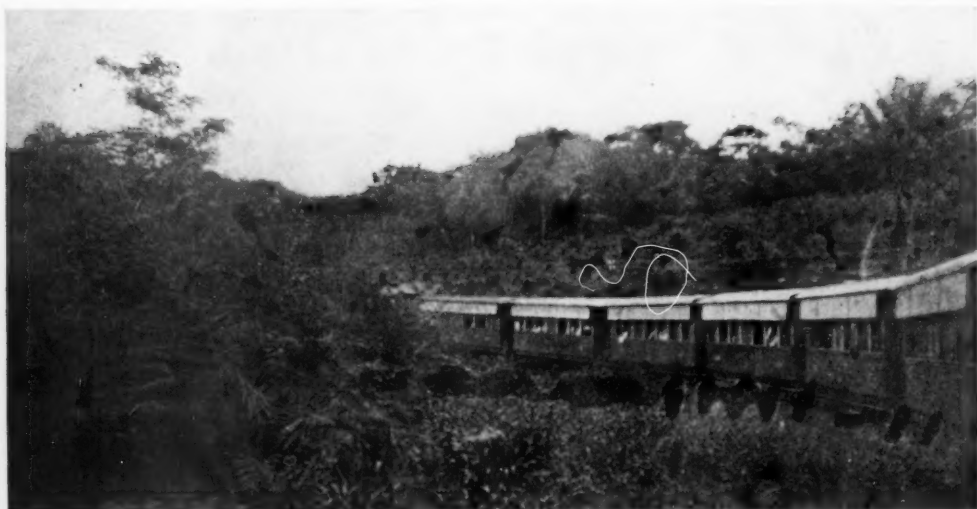


FIGURE 13.—A scene on the Nigerian Railway, climbing from the Niger-Benue lowlands up onto the High Plains of Hausaland. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)

the region, so here are gathered peoples seemingly from every tribe of the Sudan, hence the market place presents a veritable babel of languages.

Around the circumference of Lake Chad itself, is a belt of very rich soil some five to ten miles wide which is flooded annually by the lake. The lake recedes in February, so the natives migrate down to this flood plain and plant cotton and guinea corn on the rich moist soil.

None of the cotton (though it is of good grade) reaches outside markets, for transportation is too costly. Not only the margins of Lake Chad, but also much

of the entire Shari-Chad basin possesses deep black cotton soil. The natives usually do not even use it, planting their crops on lighter soils. Nor will it be used in the future unless a railway is built into the region. At present, the Shari-Chad Basin is the most inaccessible part of the entire Sudan. Hence its potentialities of cotton and cattle are not likely to be realized for some time.

UPPER NILE REGION

Stretching eastward from the wild, rough, forested Nile-Shari divide to the Abyssinian Plateau, is the region of the



FIGURE 14.—Natives fording a stream during the dry season in the Shari-Chad lowlands. (Courtesy of Keystone View Co.)

Upper Nile and its tributaries. For the most part this is a vast, low-lying plain, with here and there groups of low, round-topped hills. It is heavily forested along the Nile-Congo divide in the south, but the character of the country changes from south to north. In the south or Bahr el Ghazal the country is a fertile plain with numerous groups of trees, but with water-logged forested valleys. This park country rapidly gives way to high grass savannah country to the north and west with here and there a thorn forest.

millet and guinea corn in the leaf mould under the forest trees. The Negro population of western Bahr el Ghazal has been so thinned by former slave raids that the present density is only one person to five square miles. Around Wau and other towns, however, the population is increasing rapidly.

Farther east lies the Sudd Region, a vast lowland bordering the Abyssinian Plateau. Where the streams come down from this plateau they choke their valleys with silt, and by the force of their waters



FIGURE 15.—A field of guinea corn planted by the natives of the Shari-Chad lowlands. (Courtesy of Keystone View Co.)

The savannah passes into steppe country in southern Kordofau and Darfur. This is a region of high temperatures and excessive humidity, with small seasonal or diurnal range of temperature. The north and northwest winds blow over the plains during the winter, but these give way to the south and southwest monsoon during the summer. The monsoon causes an abundant rainfall of from fifty inches in the south to twenty inches along the eleventh parallel.

In the southwest, along the highlands, the Nyam-Nyam tribes (formerly cannibals but now a prosperous agricultural people) do not clear their land, but grubbing out the undergrowth, plant

tear away great masses of papyrus growing in their valleys. These islands of floating vegetation choke up the channels and cause the rivers to overflow during the wet season. This results in the region becoming a vast lake, two to twenty-five feet deep, during the rainy season (Fig. 16). During the dry season, the area is a great rolling, lumpy, grassy plain with swamps along the rivers. Much of this area is uninhabited, but in some localities the population has survived the dervish slave raids and the Abyssinian depredations. Here the Dinka Negroes live on the raised knolls between the swamps in little groups of grass huts. Around the huts are fields of dhurra, waving ten feet high. Here and

there can be seen raised platforms in the fields, on which perch natives, who make a great halloo and throw stones to keep off the birds. Besides raising dhurra, the Dinkas fish and keep many sheep, fowl and cattle.

North of the Sudd Region and the Bahr el Ghazal River, extending almost to the twelfth parallel is the Dar Nuba country. "Here chains of picturesque hills, rise out of the plain interspersed with numerous water courses. The intervening plains and valleys are rich in

Shilluk owners do not know how many head they possess.

The area between the White and Blue Nile is one vast alluvial plain at present almost uninhabited (Fig. 17). It will soon be irrigated and so be made to produce vast amounts of maize and cotton. In much of the area, great stretches of cotton soil occur, which is capable of producing cotton as well as almost every other tropic product known to man. The excellent waterway furnished by the Nile and its tributaries is, each year,



FIGURE 16.—A Scene in the Upper Nile Region at the End of the Wet Season. (Courtesy of Keystone-View Co.)

vegetation of every description. The soils are especially fertile and the rain plentiful." Much of this country for two hundred miles north of the Bahr el Ghazal is peopled by the Shilluk Negroes who are good farmers. Agriculture is rendered easy by the natural fertility of the soil, by the plentiful rains, and (along the river) by irrigation from the Nile, although occasional drought years cause severe famines. Nevertheless, this part of the country has often been called the "granaries of the Sudan." Cattle in some places are so abundant that the

being used to a larger degree, and the "British peace" is allowing the population to increase undisturbed. Hence the immediate river valleys are already becoming densely peopled and well cultivated. The railroad, which the British have built into the region, too, is aiding in the development of the area, and it is safe to predict that in the not far distant future, this will be the scene of extensive cotton and perhaps even rubber plantations.⁵

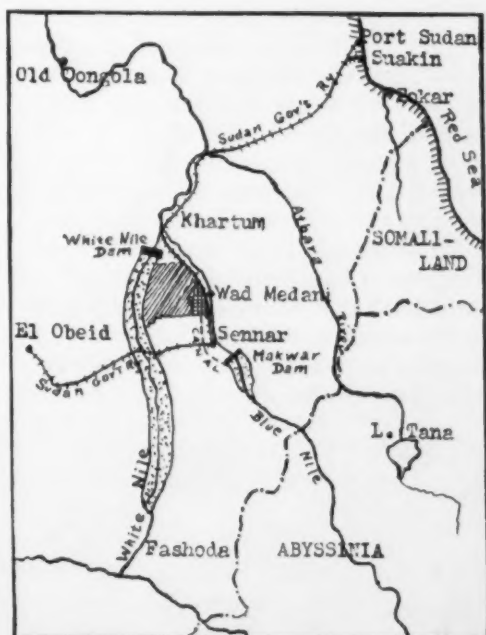
⁵ Rep't on the Cultivable Products of the Nile, W. W. Fitzgerald, p. 15.

The British are planning extensive irrigation projects on several large tributaries of the Nile, and a stage of development here may some day be reached which will rival even the highly developed Nile Valley in Egypt. Ever increasing streams of grain will then find their way out to the Somali coast and to Lower Egypt to meet the growing market there.

THE TUAREG GRASSLANDS

North of the valleys of the Senegal and Upper Niger and the high plains of Hausaland the character of the country changes (Fig. 18). The savannahs of the Sudan pass into semi-desert grasslands, a region of droughts, locusts and famine. For the most part this is a dreary expanse of country. Here an area of good grass, there an expanse of sand carrying "a few stunted and prickly bushes, in the shade of which, the cattle munch the withered grasses, while the camels and goats pick off the scant foliage."

In latitude eighteen degrees to twenty degrees this grassland gives way to the Sahara. North of the great bend of the Niger a strong northeast wind (the harmattan) blows in the winter, often bringing temperatures below fifty degrees F. Then come the southwest winds and the tornadoes, ushering in the short rainy season with its unhealthy weather. The scanty rains (five to ten inches) fall only in the four summer months. And it is during this season that the crops of barley, millet and wheat are grown. The people of this desert edge are a curious branch of the Tuaregs who have mixed with the Hausas and so have become semi-agricultural. They are a branch of the Hamitic race of Tuaregs which inhabit both sides of the deserts and all of its oases. Formerly, they were noted for their hideous slave trade, gun running and pan-Islamism, but they were conquered by a few hundred Senegalese soldiers on camels under the command of a few score of Frenchmen, and so now their lands are a part of French Sudan. They are slowly migrating southward and are now very






-  Land covered by reservoirs.
-  300,000 acres already irrigated by Makwar dam.
-  Remainder of the 3,000,000 acres soon to be irrigated.

FIGURE 17.—Irrigation in the Gezira Anglo-Egyptian Sudan may transform a great region of vast potential resources into one of the world's gardens and granaries.

numerous south of Timbuctoo, where they are mixing with the cattle-owning Fulani and the semi-agricultural Songhays and Mandingoes. Farther west they are mixing with the pastoral Jollof Negroes who live along the coast.

In fact, they range the grasslands from the Mauretanian west coast to the northern Baghirmi country, where with their goats and camels they share the pastures with the Fulanis and Arabs.

North of Nigeria they rapidly exhaust their pastures and so migrate down into Sokoto Province to graze their herds, returning to their country only when the rains cause the grasses to freshen. They exist on rather close margins, consequently when a scanty rainy season occurs (such as 1907 and 1913) they are reduced to short rations and hence are much given

to pillage and raiding. In fact, the Tibbus of Tibesti have learned to expect them regularly to come and steal their cattle. When they appear the Tibbus take all their goods with them up on to some high rock and pull the ladder up behind them leaving their cattle and grain to the raiders.

Although the Tuaregs really dominate this region, nevertheless, most of the grain and cattle are raised by the Fulani, and various agricultural and pastoral negro tribes, who inhabit the more southerly part of the grasslands. Most of

less in the north. As a result most of the region is a vast steppe covered with prickly grass, interspersed with acacia and tibeldi trees. The northern two-thirds of Kordofan may be taken as typical of this region. "The steppes of Kordofan present a dull brown vista, with here and there thickets of small acacias and villages of conical straw huts. Broad red patches mark the dukn fields, which are green during the short rains,⁶ as are also the plains, which latter, however, by mid-October have again assumed the burnt up appear-



FIGURE 18.—In the land of the Tuaregs. A Hausa caravan from Kano, Nigeria. (Courtesy of L. A. Roy, Phelps-Stokes Fund.)

the trading and caravan business is in the hands of the Tuaregs, who conduct busy markets in such cities as Barua, Zinder, Gao, Niaro, etc., and from there, travel with their caravan to Tibesti, Ennedi, Borku, Tuat, Tunis, Morocco, Wadi-Halfa or Tripoli.

THE LIBYAN GRASSLANDS

The semi-arid grasslands of the East Sudan lie north of the eleventh parallel and stretch in a broad belt some 400 miles wide from Lake Chad to the Red Sea. The climate of this area is dry yet enervating and excessively hot during the rains of June, July and August. The rains, too, are scanty, varying from twenty inches in the south to eight inches and

ance which lasts till the following June." No permanent streams exist in the area and even most of the pools are dry soon after the rainy season. Apart from wells and water stored during the rains no water is to be found. Hence most of the people (Arabs and Arabicised Berbers) are pastoral nomads of the type so admirably portrayed in Dr. J. Russell Smith's, "The Desert's Edge." Dukn, a small spiked millet, is almost universally sown, and owing to the natural fertility of the soil, surprising yields are often had. Variations in the rainfall both as to amount and distribution, however, offer scant encouragement to

⁶ Peace Handbooks, vol. 16, p. 118, Gr. Br. For. Office.

would-be agriculturists, so the region is bound to remain one of flocks and herds. Even at that, the pastures are so quickly exhausted that the Arabs every year drive more than a hundred thousand sheep and cattle southward into the valley of the Bahr el Arab to graze on the pastures there (Fig. 19).

The general relation of man to his flocks and herds, supplemented by small scale cultivation of millet or dukn is supplanted by other relations in a few localized spots. In the Red Sea Province lying within the region, there is a long line of hills some 3000 feet high, usually surrounded by mists and clouds, which are precipitated as gentle rains in winter and as cloudbursts in summer. At this latter season the River Baraka becomes a flood and inundates some 50,000 acres near Tokar. This area is sown mainly in cotton and as a result the population of the vicinity is approximately one person per acre, 65 per cent of whom are farmers, and the rest, breeders of camels, cattle and sheep in the hills. The harvesting of the cotton crop is done mainly by Hausas, Bornuese and Fulani from the West Sudan, who pass through the country on their way to Mecca.

The river Nile flows for 200 miles through the province of Berbera, and down in the immediate Nile Valley there can be seen well tilled fields supporting a dense population—a striking contrast to the usual semi-arid aspect of the country. However, during the summer, when the torrential rains fall, much of the population moves "en masse" out into the desert east of the Nile, to grow their crops of dura millet in and around depressions which have caught the rain water. Needless to say this enables them to escape the drudgery of working the sakia and shaduf along the Nile.

Darfur, farther to the west, is much the same as Kordofan and the Nile and Red Sea portions of the region, except that in western Darfur the country improves and cultivation becomes more marked as the country rises to an elevation of over two thousand feet.

These same uplands continue northwest for some 800 miles, terminating in the Tibesti Highlands in latitude 20° N. Tibesti is the home of the Tibbus, the most northerly race of Sudanese Negroes. Their country consists of a mass of old granites, culminating in the volcanic peak Tusidde, some eight thousand feet high. Surrounding this central crystalline core is a broad tableland some three thousand feet high. Most of this tableland is bare and the country would not be habitable were it not for the moisture from Lake Chad and the Gulf of Guinea in the upper air which is condensed and falls in showers during August. The waters from these showers rush down the deep valleys which scar the edges of the tableland and lose themselves in the sands below. "Fortunately some of the water is caught in depressions of the valley and here the people congregate.⁷ A little grass and a few shrub spring up, affording pastures for the animals and enabling the people to cultivate patches of wheat, dates and vegetables. This is the land of the goat, ass and camel, thousands of which live in the valleys, nibbling the tough grass and shrubs." The people live entirely upon milk and their meager stores of grain, dates and vegetables, and keep warm at night by little fires of dried camel dung. Their highlands are the center for all caravans crossing the eastern Sahara and they are great traders and caravan owners, easily outdoing the Arabs at trading. Salt is their chief item of export, much of which goes to Darfur, Wadai and Lake Chad.

West of Darfur, and some five hundred miles south of Tibesti, stretches the gigantic plain of Wadai, broken only by solitary stony hills. Thorn scrub and thick bush covers much of the country with here and there a stream or a dry wady. Occasionally one comes across small villages of flat-topped houses, made of sun-dried brick, and surrounded by patches of durra, peanuts or watermelons. Finally Abeshr is reached, an important

⁷ Jerome Dowd, "The Negro Races," p. 127.



FIGURE 19.—A camp of pastoral nomads in the Libyan Grasslands. (Courtesy of Underwood and Underwood.)

caravan center, filled with scores of races of people. In old times this was the center of the whole slave trade of the Eastern Sudan. Two great slave caravan routes started from Abeshir; one north to Tripoli, and the other east through Kordofan to the Nile. The arid country was a bit hard on this trade, as fully seventy-five per cent of the slaves perished on the way. In fact many of these old slave routes can still be traced clear into Asia by the bleaching bones of the Sudanese who perished on the way.

West of Abeshir, the level plain is covered with acacia and dom palms. Much of the land is in dukn cultivated by Bulala negroes, heavy pug-faced Sudanese. The western half of Wadai is sandy, and is covered with aromatic grass, broken by dom palms. These plains are inhabited by Gouran Arabs, who live a wandering life in tents, moving about following the water holes. Large sheets of water cover much of the country after the rains but these rapidly drain away leaving excellent meadows upon which these Arabs graze fine cattle and mares.

North and northeast of Lake Chad lies Kanem, a sandy desert-like country

occupied by wandering Arabs. Numerous deep little valleys are found hidden away in this sandy plain, which almost might be called long narrow water holes. "These are full of tropical vegetation, rich soil and plentiful water and cool damp atmosphere. These little valleys are strange features in this parched and almost rainless semi-arid country. The Kanembu natives cultivate these little valleys⁸ and many of them look like gardens." Irrigation is practiced on a small scale by means of the Egyptian Shaduf and little channels from their wells. Farther west, lies the sandy country north of Lake Chad where the sand dunes are ever encroaching on the northern shore of the lake, and flocks of ostriches roam over the country.

This region in general is capable of producing large quantities of livestock, but the great lack of transportation facilities effectively retards its development. The railway which the British have built from Port Sudan and Suakim on the Red Sea as far inland as El Obeid, has been successful to a high degree, for in 1917, from the little province of Berbera alone,

⁸ Phillip Brocklehurst, "Across Wadai," *Geog. Jour.*, Apr., 1922, p. 23.

18,000 head of sheep were exported every month to Europe. No real difficulty would be encountered in continuing the railroad through the entire region to Kano in Nigeria, and before many decades this line will most probably be built.

CONCLUSIONS

The Sudan as a whole is destined in the future to become a large producer of raw materials and foodstuffs. It will help to satisfy the ever increasing demands in industrial Northwest Europe, and receive in return European manufactured articles. Most of the Sudan today seems almost like an unoccupied region, but it has potential possibilities of development

that make it a rival of India with her teeming millions; the geographic conditions in the two are not dissimilar. When such an ultimate stage of development is reached the semi-arid grasslands of the Sudan will export much livestock, while the savannahs will pour streams of grain, cotton, vegetable oils, fruits, gums and rubber into the industrial maw of the North Temperate Zone; but before such ultimate development can be reached, many grave problems of labor, transportation, and social organization must be solved by the European Powers which have assumed the task of bringing the Sudan into its proper place in future world economics.

THE SIGNIFICANCE OF LAKE TRANSPORTATION TO THE GRAIN TRAFFIC OF CHICAGO

Richard Hartshorne

Geographer, University of Minnesota

LAKE transportation has determined the preëminent importance of Chicago in the grain trade of North America.¹ One fifth of the total recorded grain movement of the United States passes through Chicago (Fig. 1). The city's focal location at the head of Lake Michigan, the southwesternmost projection of the Great Lakes Waterway into the very center of the fertile agricultural region of the great central valleys where the great trunk lines of the continent converge upon the waterway, has made of it a colossal hopper into which the grain fields of the whole West pour their harvests, and made of the lake route one of the great delivery chutes to the densely populated industrial regions of the United States and Europe. Lake shipment of grain from Chicago constitutes about two fifths of the grain shipments from that place, a movement which amounts to about 85 per cent of the total shipments from the ports of Chicago (Chicago and South Chicago), and forms the largest single item of lake traffic at those ports, except the receipts of iron ore.

In comparison with other grain shipping ports on the Great Lakes, Chicago-South Chicago is third in importance, being exceeded only by Duluth-Superior and Fort William-Port Arthur. The lake movement at Chicago is of particular interest, however, because of its comparative relation to the much larger rail movement, a relation not found at the Superior ports. Furthermore, grain is

the one important commodity for which there is active competition at Chicago between the rail and lake carriers.

In analyzing the significance of Lake Transportation to the grain traffic of Chicago, it is necessary to show the influence of the factors affecting the origin of receipts, the destination of shipments and the routes and methods of transportation employed.

FACTORS AFFECTING RECEIPTS AT CHICAGO

There is no considerable part of the surplus grain producing area of North America for which Chicago is the only gateway to eastern markets, and at the same time, there is no portion of the area for which Chicago is not at times used as a gateway. Nevertheless there is a relatively restricted area from which Chicago normally receives the great bulk of the grain which it markets, and for which Chicago is the chief market (Fig. 2). This is the western portion of the so-called "Corn Belt"—Illinois, Iowa, and southern Minnesota. As all but a small portion of the "primary" receipts at Chicago (grain received direct from country elevators) come from this restricted area, the importance of Chicago as a "primary market" is due, not so much to the size of its tributary area as to the great intensity of production within it, particularly of the feed grains—corn and oats (Fig. 3).

Nearly half of the commercial movement of corn and oats in the United States, and a much larger proportion of the movement to "primary markets" (as distinct from the scattered movement between small centers,) comes from this region (Fig. 4). This explains the

¹ The outline of this and allied studies is published in "Summary and Outline of the Report on the Chicago River Bridge Survey," submitted to the Mayor and City Council of the City of Chicago, June 15, 1925, prepared by Griffenhagen & Associates, Ltd. Note pp. 13, 143-149. All the graphs shown in this article were prepared for that Report.

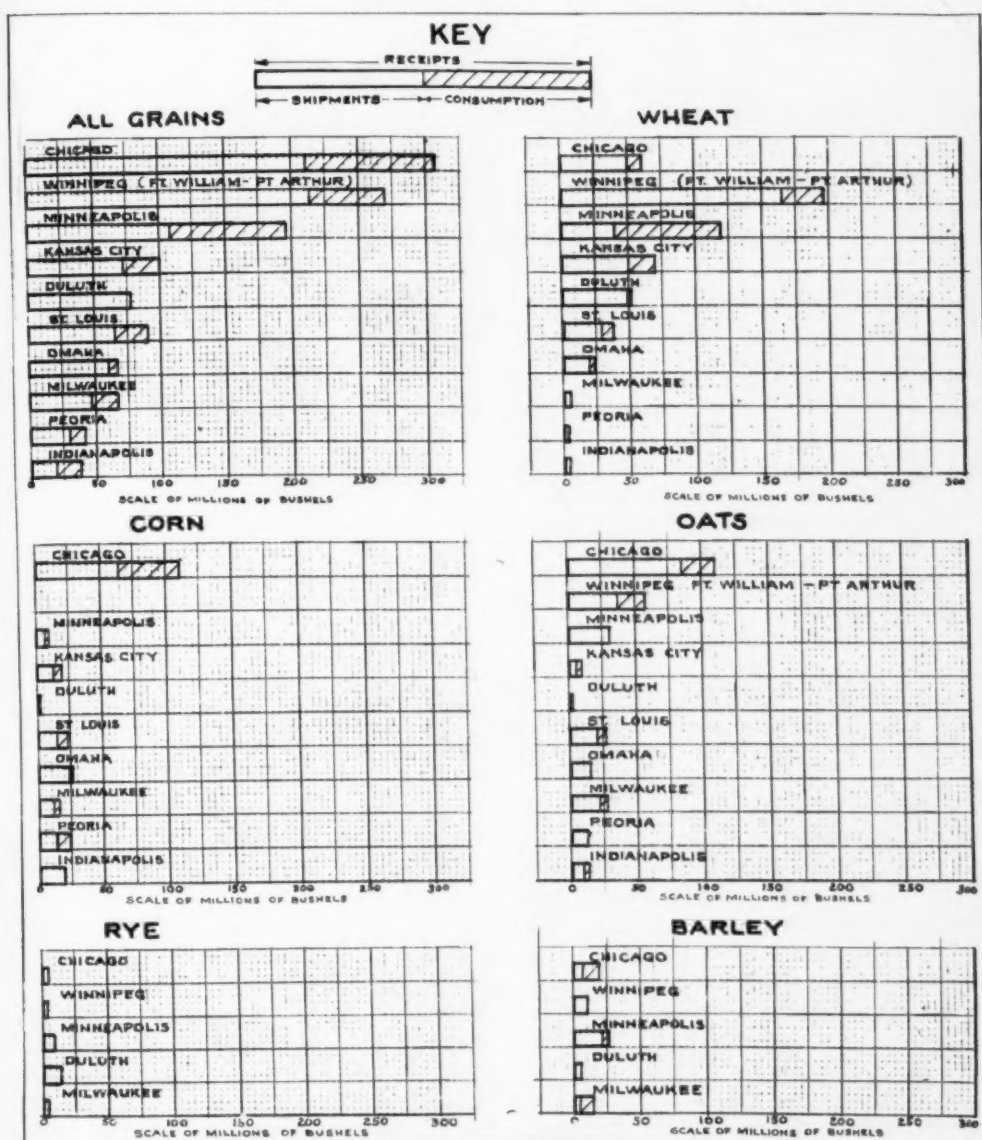


FIGURE 1.—The preëminent position of Chicago in the grain movement of North America is shown by the grain receipts, shipments and consumption, 1914–1923. (Courtesy of Griffenhagen & Associates, Ltd.)

preëminent position of Chicago in the movement of corn and oats; it handles over 40 per cent of the shipments to primary markets.

Though Chicago is the chief market for Illinois and Iowa, handling nearly two thirds of their total shipments to primary markets, it competes with many other markets, including smaller consuming centers,—Peoria and Indian-

apolis,—and shipping centers near the borders of the area—Milwaukee, St. Louis, and the Missouri River markets (Fig. 5). Competition of markets is keener in this region than in any other portion of the surplus grain area. Chicago aside from the great attraction of lake transportation has, as the chief railroad center and terminal of the region and with direct connections from all

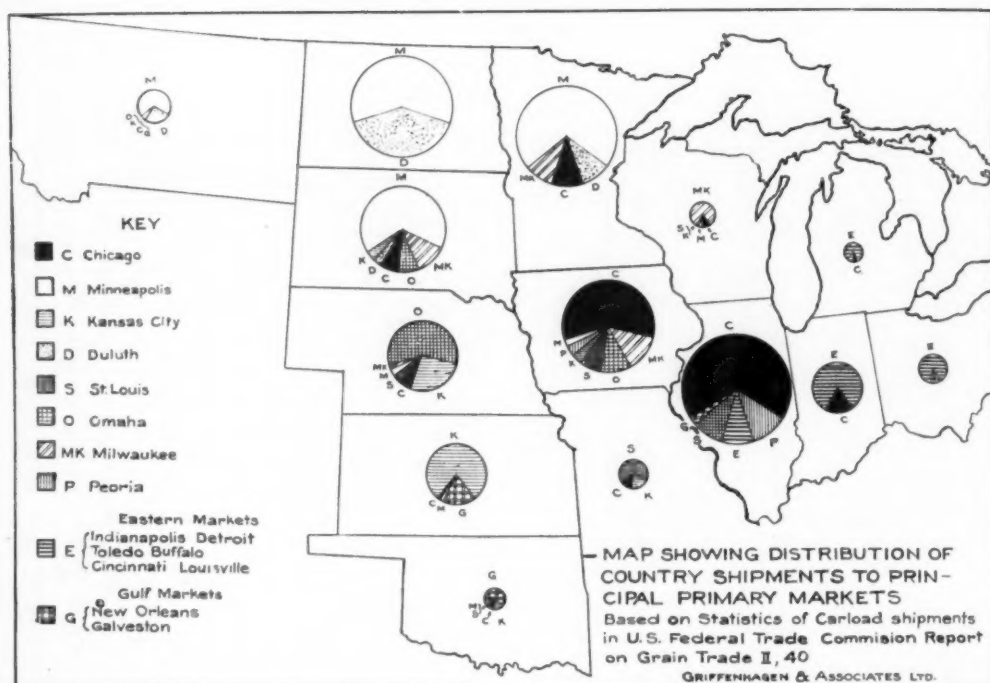


FIGURE 2.—Chicago is the chief market for the grain of the western part of the "corn belt" especially that part in Illinois, Iowa, and southern Minnesota, and receives the great bulk of its grain from this area. (Courtesy of Griffenhagen & Associates, Ltd.)

parts, the most important advantage in competing for the traffic.

A careful study of unpublished statistics of the destination of shipments from country points reveals that within this region the routes, terminal facilities (including railroad owned elevators) (Fig. 6), and business policies of railroad companies are of greater significance than the small differences in distance and topography. Although the destination of shipments is determined by the shippers, *i.e.* the country elevators, where the rates to different markets are "equalized" as is the case in most of this region, the railroad serving a particular elevator is in a position to influence the shipper's choice of market. In most cases this influence favors Chicago.

In the movement of wheat Chicago is a primary market of minor importance, owing to its location at a considerable distance east of, and either north or south of, the surplus producing areas (Fig. 7). Primary receipts of wheat at Chicago

come chiefly from the soft winter wheat belt of Illinois, Missouri, and Iowa, but for the greater part of this area St. Louis and the Ohio River markets are better located. The regions of hard wheat production are tributary to centers nearer than Chicago, the Canadian Northwest to Winnipeg, the American Northwest to Minneapolis and Duluth, and the Southwest to Kansas City, Omaha, and the Gulf ports (New Orleans and Galveston). Chicago, however, functions somewhat as a "secondary market" receiving wheat from these primary markets.

Rye and barley movements at Chicago are small because these grains are of minor importance in production and in commercial movement, and because the surplus areas in the Northwest are tributary to the markets of that region.

FACTORS AFFECTING SHIPMENTS FROM CHICAGO

The chief factors affecting shipments from Chicago are the consuming markets,

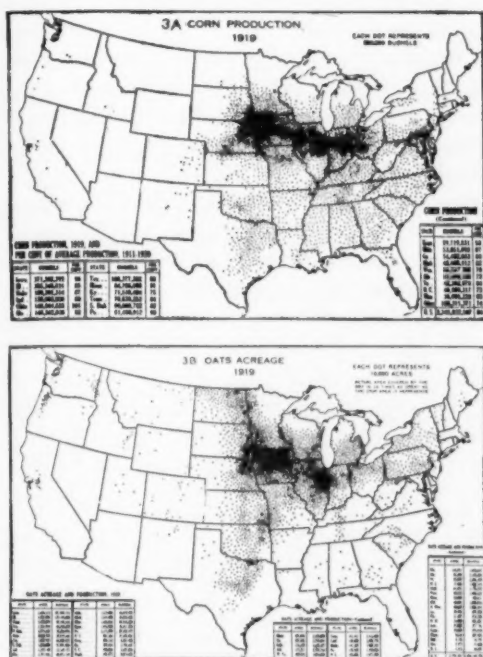


FIGURE 3.—The importance of Chicago as "primary market" is due to the intensity of the production of the feed grains—corn (3a), and oats (3b), in its tributary area. (Courtesy of the U. S. Dept. of Agriculture.)

the transportation routes from producing regions to Northeastern United States and Europe, and local facilities at Chicago.

The Markets

The consuming markets for the surplus grain of the producing regions of the Interior of the United States include both domestic and export markets.

The export market, chiefly in Northwestern Europe and Italy, fluctuates widely from year to year because of many factors in various parts of the world, and also varies more definitely over a period of years because of changing conditions in Europe and in the surplus producing countries which compete with the United States.

In the domestic markets, aside from what is needed for mixing, most wheat required in consuming areas moves in the form of flour. However, Buffalo, second only to Minneapolis as a flour manufacturing center² is a notable exception ow-

² Northwestern Miller (Minneapolis), The Miller's Almanack, 1924, p. 209.

ing to its location at the eastern terminus of the Great Lakes Waterway, the most advantageous point for receiving and storing grain brought by cheap water transportation, and the one point where major routes from all the great wheat regions of the continent meet to diverge to eastern and European Markets (Fig. 8).

On the other hand large amounts of corn and oats³ are shipped as grain to various portions of the United States, particularly in the east, amounting normally to much more than the export movement. The domestic markets for grain in the United States can be listed as follows: the Buffalo mills market for wheat; the North Atlantic (New England and Middle Atlantic states) "feed" market requiring perhaps 100 million bushels of corn and nearly two thirds as much oats; the Southeastern market for large quantities of oats, small amounts of corn and still less wheat; and the Southwestern and Far Western markets requiring both oats and corn.

Chicago is poorly located with respect to the two latter markets to the West and consequently ships little grain in that direction (less than 4 per cent of the shipments are sent on other than eastern and southeastern lines). With regard to the markets to the southeast, Chicago is not as well located as certain other centers excepting for the movement of hard spring wheat for mixing, for which Chicago is the chief gateway because of its relation to the railroads from the Northwest.

With respect to the domestic markets and the export ports of the North Atlantic seaboard, Chicago has the distinct though minor advantage of nearness, in terms of time of shipment, over the Missouri River and Northwestern centers. The great advantage, however, which Chicago has in shipping to the seaboard is its superior location with respect to the routes of grain movement from the

³ U. S. Dept. of Agriculture, Bulletin #696, Geographic Phases of Farm Prices: Corn; Bulletin #755, Geographic Phases of Farm Prices: Oats.

producing regions to the consuming regions on the North Atlantic seaboard and in Europe (Fig. 9).

Transportation Routes

Routes of export grain from interior North America include the Gulf routes through New Orleans and Galveston. These ports, used chiefly for exports from the southwestern wheat region, the chief wheat exporting region of the United States, ship large amounts of wheat, nearly equalling, on the average, the total exports of American wheat from North Atlantic ports, but relatively small amounts of other grains. Since the distance from Chicago to the Gulf,

port movement. The "lake" routes, whether from Lake Superior ports or Lake Michigan ports may be divided into four principal groups: two "all-water" routes and two groups of "lake-and-rail" routes (Fig. 10).

The principal all-water route passes to Lake Ontario by means of the Welland Canal and down the St. Lawrence River, avoiding various rapids by means of four canals, to the head of ocean navigation at Montreal. This route, used exclusively for export via Montreal and its winter ports, St. John and Portland (and to a small extent Quebec, in the summer, and Halifax, in the winter) is not only the major route of Canadian shipment but

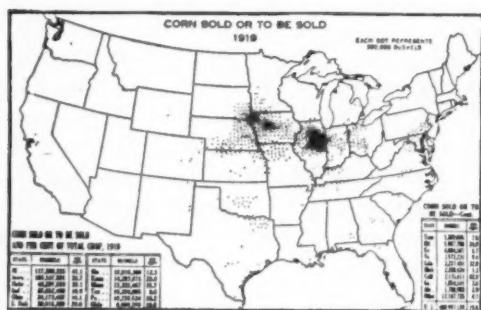


FIGURE 4.—Nearly half the commercial movement of corn in the United States centers upon Chicago. (Courtesy of the U. S. Dept. of Agriculture.)

measured either in terms of mileage or rates, is no less than to the Atlantic ports and ocean rates from Gulf ports are somewhat higher, Chicago normally takes no part in this movement.

In contrast with the Gulf ports, the ports and domestic markets of the North Atlantic seaboard, from Montreal to Baltimore, receive shipments of grain over many routes from nearly all the surplus-producing regions (Fig. 9). The routes of shipment from each of the regions include not only a number of "all-rail" routes but also routes which for a major part of the trip utilize the natural advantage of the Great Lakes Waterway. During two thirds of the year when the connecting channels are open, these lake routes are used for much the larger part of the movement, especially the ex-



FIGURE 5.—The distribution of the principal primary grain markets in the north central part of the United States indicates the advantage of a location between the large surplus grain regions and the great market areas. (Courtesy of Griffenhagen & Associates, Ltd.)

also is of particular importance to the lake movement through Chicago. While most of the grain shipped over this route is transferred from large lake vessels (Fig. 11), to smaller ships or barges at Port Colborne (and to some extent at Buffalo), a considerable part moves all the way in smaller vessels (Fig. 12).

The export movement through Montreal, and its winter ports, also utilizes the lake-and-rail routes through the five Georgian Bay ports and Goderich. These Canadian routes are also used to a large extent for shipments of American grain, corn and oats, into the domestic market of New England (Fig. 13).

Much the most important group are the lake-and-rail routes through Buffalo

and the minor Lake Erie ports—Erie, Pennsylvania, and Fairport, Ohio—to the domestic markets of Northeastern United States and the exporting ports of New York and its "out-ports", Boston, Philadelphia, and Baltimore. These routes, like the routes through Georgian Bay ports involve lake shipments, in full-size vessels to elevators at eastern lake ports, and reshipment by rail, either promptly, or after a period of storage. The movement of wheat to the Buffalo



FIGURE 6.—Rock Island Elevator on the South Branch of the Chicago River. Railway-owned elevators constitute an important factor in the destination of shipments from country points. (Courtesy of H. J. Reber.)

mills, reshipped by rail as flour, may be included in this class.

The second all-water route, and the only one available for domestic shipments, involves lake shipment to Buffalo, and a transfer from lake vessels at Buffalo to barges which pass through the Erie Canal and Hudson River to New York. This route is used principally for export from that port and to a small extent for shipments to the domestic market of New York City.

A route of minor importance not included in the above grouping is the "lake-river-and-rail" route through Ogdensburg, New York, to the domestic market of northern New York and New England (Fig. 14).

The preëminent position of Buffalo as an eastern lake transfer point, resulting originally from the Erie Canal but to a greater extent today from its many con-

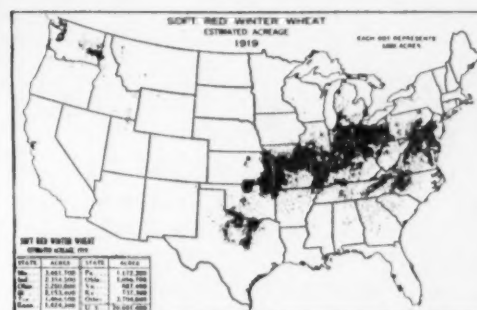
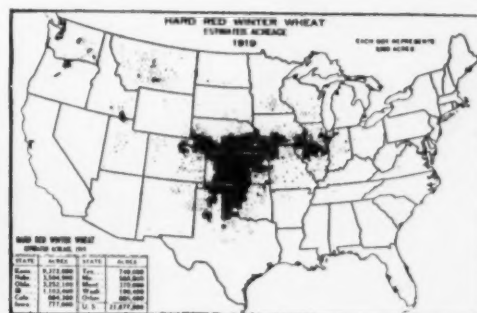
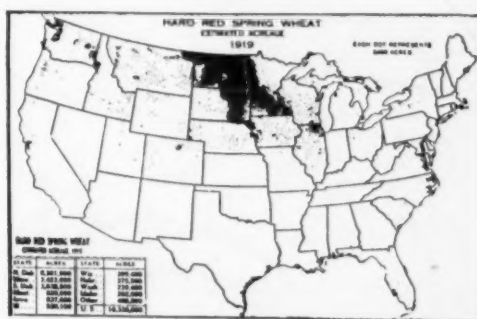
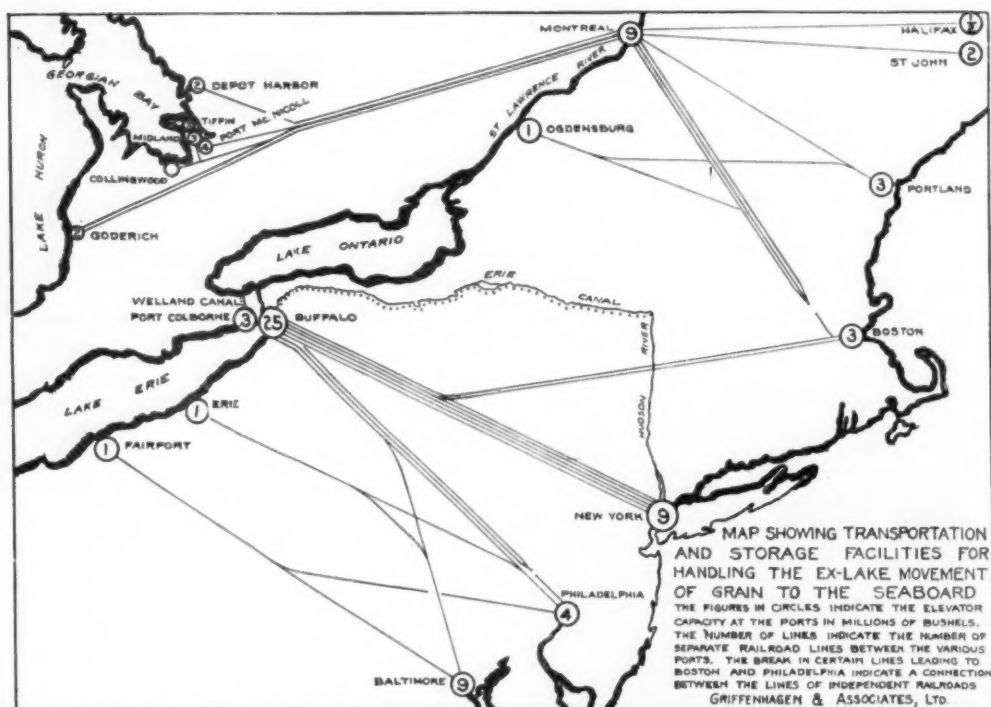


FIGURE 7.—All the great wheat growing regions of the middle West are tributary to Chicago; the railways that traverse these regions all converge upon Chicago. (Courtesy of the U. S. Dept. of Agriculture.)

nections with the North Atlantic seaboard from Boston to Baltimore (and also its water connection with Montreal) is shown so clearly in the diagrams as to require no discussion (Fig. 8).

The advantageous location of Chicago with relation to most of the routes just outlined is likewise evident. This advantage is especially important with respect to the lake routes and to a less extent to the all-rail routes.

These rail routes are naturally divided into three groups by the barrier formed



FIGURES 8.—The importance of Buffalo in the waterway-rail movement of grain is indicated by its elevator capacity as compared with that of other lake and river ports, and by the relative number of railway lines connecting Buffalo and other grain centers with the Atlantic seaboard. (Courtesy of Griffenhagen & Associates, Ltd.)

by the three upper lakes. The Canadian lines passing north of the barrier are used exclusively for the relatively small winter shipments from the Canadian Northwest. The lines which cross the barrier, either by bridge at Sault Ste. Marie or by ferry across Lake Michigan, carry only a small amount of grain, chiefly from the American Northwest. None of these lines bring grain to Chicago, but divert grain from it.

The rail routes passing south of Lake Michigan are the most important in the grain movement, being used to a greater or less extent for shipments from all the surplus producing regions of the United States (Fig. 15). The various western lines from these regions connect with the eastern trunk lines at Chicago and St. Louis, and a few minor gateways such as Peoria. The preëminence of Chicago in this respect is of course due in large part to the effect of the Great Lakes as a means of water transportation and also

as a barrier to land transportation from the northwest. Largely for the same reasons Chicago enjoys certain railroad privileges, particularly "equalization of rates" with respect to the entire surplus producing area in the United States, which means that from any point in the area west of Chicago, from the Canadian border to Kansas, the total rate for rail shipment to any North Atlantic point is as low by way of Chicago as the rate over the shortest route.⁴ Consequently, Chicago is the chief gateway for the lines from the Northwest, and an important gateway for the lines from all the other producing regions of the United States.

All of the lake routes, previously outlined, are reached from the producing regions through either of the two western branches of the waterway, Lake Superior or Lake Michigan. As these two lakes are approximately equal in length, the

⁴ U. S. Interstate Commerce Commission, Annual Report, v. 58, p. 220.

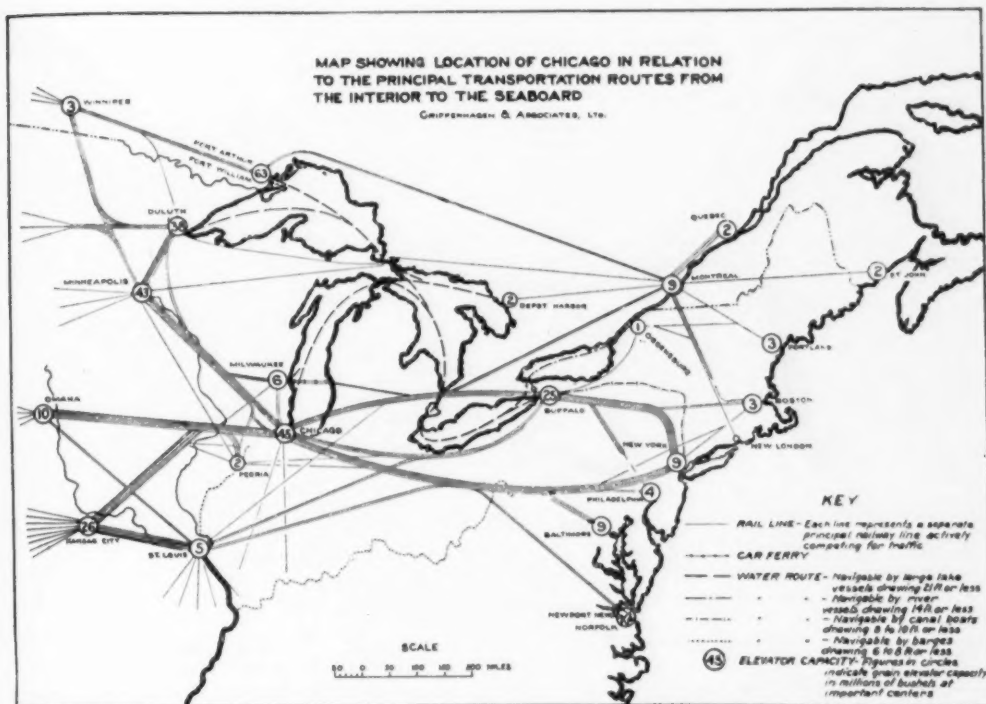


FIGURE 9.—The importance of Chicago as a grain market is primarily due to its location between the great grain-producing areas and the great food-consuming centers; and between the wheat-producing areas with exportable surplus, though well to the eastward. It is a focal point, a concentration center, for the railway net that handles the grain traffic, and offers the widest choice of routes to the seaboard. (Courtesy of Griffenhagen & Associates, Ltd.)

distances from the ports at their heads to eastern ports are about the same.⁵ This is reflected in nearly equal rates, time, and other conditions of transportation, except the little longer season of navigation from Lake Michigan. The relative use of these two branches for grain shipments depends largely, therefore, on the location of their ports with respect to the producing regions. Consequently the Lake Superior ports, Fort William-Port Arthur, and Duluth-Superior, handle the entire lake traffic from the Canadian Northwest and all but the southern margin of the American Northwest. On the other hand, because of the southern extension of Lake Michigan, Chicago is advantageously located with

relation to the traffic from most of the central West, including Illinois, Missouri, and southern Iowa, and from the Southwest, including the traffic from the primary markets at Kansas City and Omaha,—Milwaukee competing to only a minor extent in the northern portion of the area. Throughout a wide belt (a belt constantly hanging to some extent with changes in the local rates) between these two tributary areas, Duluth, either directly or through Minneapolis, competes with Chicago and Milwaukee.

Local Facilities

In addition to its advantages of location Chicago has certain minor advantages resulting largely from the traffic itself, such as the large local consuming market, and the facilities for handling and marketing the grain.

Physical equipment for handling, storing, and treating grain at Chicago is sur-

⁵ The distances to eastern ports are 93 miles greater from Duluth than from Chicago, from Fort William 30 miles less, except that to Georgian Bay ports the differences are 78 miles and 44 miles respectively. U. S. Lake Survey, Bulletin, No. 33.



FIGURE 10.—The destination of lake shipments of grain from Chicago emphasizes the importance of the different classes of routes and the marked advantage to the shipper of having available a choice of export ports. (Courtesy of Griffenhagen & Associates, Ltd.)

passed only at Fort William-Port Arthur and Minneapolis. There are 62 elevators with a capacity of 52 million bushels, of which 32, with a capacity of 43 million bushels, are commercial elevators (*i.e.* other than those used largely by local manufactures). The location of all the important commercial elevators on either the Chicago or Calumet River, with access to lake vessels shows the significance of Lake transportation (Fig. 16).

The marketing facilities for handling the grain business, particularly the "futures" trading market, unrivaled at any American center, owe their pre-eminence not only to the actual grain handled at Chicago, but also to its advantageous medial location for receiving grain from regions not ordinarily tributary to it, and to its location on the lake waterway which enables it to draw on the supplies at Lake Superior ports.

In large part because of the importance of the receipts of corn and oats, Chicago has become the chief consuming center

for those grains, but because of the relatively small amount of flour production has not the advantage of a large local demand for wheat.

SUMMARY OF ANALYSIS OF GRAIN TRAFFIC

Of fundamental importance is the location of Chicago on the marketward (eastern) margin of the area of densest production of grain, an area producing nearly half the surplus corn and oats of the United States, and a significant part of the wheat surplus. Because of its location a considerable distance east of, and either north or south of, the principal wheat producing regions, Chicago is largely a "secondary market" for that grain, but at the same time a large one because of the influence of "future trading" on the movement of wheat. Chicago's terminal position for the railway lines serving the producing regions allows it to compete with nearby points.

The central location of Chicago is



FIGURE 11.—A modern large freighter which carries grain from Chicago to Georgian Bay ports or the ports at the eastern end of Lake Erie. (Courtesy of C. F. Jones.)

highly advantageous with respect to the rail routes from all of these producing regions to the domestic markets and export points of the North Atlantic seaboard. Its location at the southwestern terminus of the Great Lakes Waterway, makes it the most advantageous port for shipments over all routes to the Seaboard from the central West and the Southwest. These facts, together with the barrier effect of Lake Michigan, have also been of chief importance in the development of Chicago as the railroad center of the interior, the common terminal of the principal eastern as well as western lines, and the establishment and maintenance of "equalization of rates"



FIGURE 12.—A considerable portion of the grain moving by this all-water route from Chicago to Montreal is transferred at Port Colborne from large freighters to vessels which can navigate the small canals on the St. Lawrence. (Courtesy of C. F. Jones.)

through the Chicago gateway, which are its principal advantages with respect to

the all-rail routes. Thus, Chicago has a great advantage over all other forwarding points in the number and variety of the available routes to the Atlantic seaboard.

ADVANTAGES OF LAKE TRANSPORTATION

On the basis of this analysis of the grain traffic of Chicago it is concluded that lake transportation has been and is of significant advantage to the grain trade of Chicago for five principal reasons.

During the period of railroad construction lake transportation was one of the prime factors in the development of Chicago as the chief railway terminus and center of the interior of North America. These railway facilities constitute the unique and most important advantage possessed by Chicago in competing for the grain traffic.

This dominant railway position, together with the availability of lake transportation, are the principal factors underlying the practice of "equalization of rates" by which Chicago is able to serve as a railroad gateway to eastern and foreign markets from almost all parts of the surplus area of the interior of the United States. On the other hand, the effect of the competition of lake transportation in lowering railroad rates has been of general advantage with respect



FIGURE 13.—“Package Freighter” in the Chicago River. These vessels commonly employed in the inter-lake package freight traffic to eastern lake ports may carry either small cargoes of grain in the hold, with flour or other package freight between decks or full cargoes of grain, the side-ports being sealed. Much of the movement to Georgian Bay ports is handled in vessels of this type. (Courtesy of H. J. Reber.)

to all centers and not of particular advantage with respect to Chicago. (Discriminating rates, rebates, *et cetera*, have been outlawed and there is evidence to refute the testimony of the trade that the law, for the past decade or more, has been well enforced.⁶).

The fact that Chicago is on the Great Lakes Waterway gives it notable advantages over centers not on the Great Lakes, particularly those offered by the many lake routes to eastern and foreign markets.

Because of its combination of lake and rail transportation Chicago is preëminent among grain centers in facilities and routes, a fact of particular importance in times of heavy movement of grain.

The fact that Chicago is the southwestern terminal of the Great Lakes Waterway makes it the most advantageous port for shipments by lake from most of the central West and the Southwest to eastern and foreign markets.

Insofar as the position of Chicago as a railway center is a factor in certain of these conclusions, it is evident that the influence of lake transportation is of historic importance only. With regard to the railway rate structure, however,

⁶ U. S. Interstate Commerce Commission, XX, 511, 513.



FIGURE 14.—Ogdensburg Package Freighter in the Chicago River. These vessels handle the traffic (grain east-bound and package freight west-bound) on the lake-river-and-rail route to New England via Ogdensburg. They are of a smaller type in order to pass through the Welland Canal. (Courtesy of H. J. Reber.)

it could not be presumed that it would be maintained by the force of custom and present conditions without lake transportation. The last three advantages dependent on the continued availability for use of the lake waterway are effective largely, to the extent that lake transportation is used. The statistics of the lake movement of grain at Chicago indicate four noteworthy conditions each of which requires explanation.

1. Minor Importance of Receipts of Grain by Lake

First, the movement of grain by lake to Chicago from Lake Superior ports forms an almost insignificant portion of the total receipts at Chicago owing to the location of Chicago far to the south of the lake routes from the Northwest to the East. Occasionally, however, large shipments from Lake Superior are received at Chicago, particularly when prices at Chicago are, because of future trading activities, relatively higher than at other markets.

2. Relative Importance of Lake Shipments

Second, lake shipments from Chicago constitute but two fifths of the total east-bound movement from that center, the proportion being higher for wheat



FIGURE 15.—Modern Elevator on the Calumet River, Chicago. The connection of the various railway lines from the surplus grain regions to the west with the Great Lakes Waterway and the eastern railroads gives Chicago a marked advantage over other large grain markets. (Courtesy of Morris Grain Co.)

than for corn, but much lower for oats (Fig. 17).

The use of lake transportation is dependent primarily on the saving in costs of shipment. The cheapness of the water haul results from the free use of a natural deep waterway, improved at public expense, from the large size and economical operation of carriers on such

a waterway, and from the related traffic in other commodities, particularly the great bulk movement of coal, ore, and stone.

Lake transportation is utilized for the lesser part of the eastbound shipments from Chicago, whereas at the Lake Superior ports much the larger part of the movement is by lake, owing to the small



FIGURE 16.—Modern Grain Elevator, Calumet River, Chicago. The size of the establishment gives some idea of the physical equipment needed for cleaning, drying, and storing grain for transportation, important functions of elevators in terminal markets. (Courtesy of John S. Metcalf Co.)

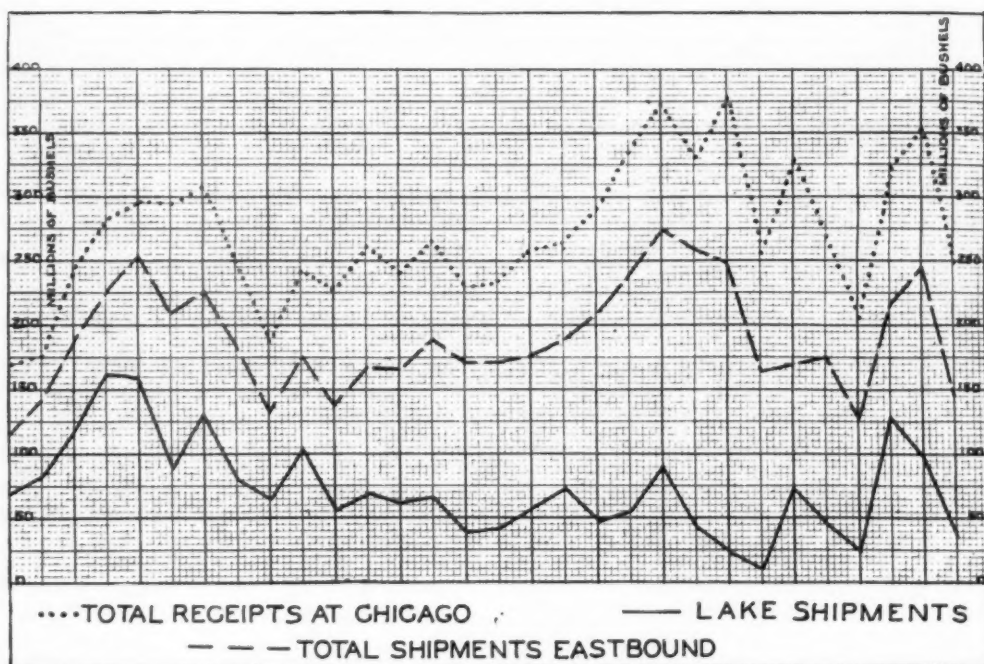


FIGURE 17.—Lake shipments of grain compared with total east-bound shipments, and receipts at Chicago, yearly 1894-1923. (Courtesy of Griffenhagen & Associates, Ltd.)

saving effected (less than 2 cents per bushel) by the use of lake transportation at Chicago and the larger saving (usually more than 6 cents) from Lake Superior ports. As much the greater part of the lake traffic moves over lake-and-rail routes this saving is determined largely by the difference between the all-rail rates from western lake ports to seaboard and the "ex-lake" rail rates from Lake Erie and Georgian Bay ports. To provide a saving this difference or "remainder" must be sufficient to more than cover the lake rate, which varies both from day to day and year to year, and minor charges for insurance and brokerage. For example, for wheat shipments from Chicago to New York the all-rail rate is 18 cents per bushel, the ex-lake rate from Buffalo 12.4 cents per bushel (officially 30 cents and 20.67 cents per hundred pounds, respectively), giving a "remainder" of 5.6 cents per bushel. From this figure must be subtracted the lake rate, from 1.5 to 3.5 cents and the cost of insurance and brokerage, usually half or three

quarters of a cent per bushel, leaving a saving somewhere between three and a half and one and a half cents per bushel.

The rail rates and consequently the "remainder" obtained from them, and the ultimate saving effected, are different in the case of (1) other grains, (2) export shipments, and (3) shipments to other domestic points and exporting ports, the "remainders" ranging all the way from 1.6 cents per bushel on exports of oats via Baltimore, to 5.8 cents per bushel on domestic wheat shipments to Boston (ex-lake from Georgian Bay).

A detailed study of the rates from Chicago during a recent fairly normal period indicate the following conclusions: (1) Though the maximum saving is two cents per bushel (four cents at times in 1924), the average saving is much less, and on some shipments there is no saving. (2) The savings on shipments of oats are so low, owing to the light weight of the grain cutting down the number of bushels ships can carry, as to be of no value in most cases. This accounts for

the small proportion of oats shipped by lake. (3) The savings on exports are less than on domestic shipments, but these are more than offset by other factors. (4) The savings on shipments via Georgian Bay routes are higher than those via Lake Erie routes, because of the relatively lower rates maintained on Canadian railroads as compared with American roads and, to a lesser extent, because of the shorter lake distance to Georgian Bay ports. That this is an advantage both to the export trade at Montreal and to the New England domestic market is demonstrated by the extensive use of these routes for Chicago shipments. (5) The routes to New York and more northerly points offer greater savings than those leading to points south of New York, so that for shipments from Chicago to the region and ports south of New York, particularly domestic shipments, lake transportation has little advantage.

The two all-water routes from Chicago—the Great Lakes-Erie Canal-Hudson River route to New York and the more important Great Lakes-St. Lawrence River route to Montreal—both offer somewhat cheaper routes and also serve as important checks on the rail rates from eastern lake ports. Rates via the St. Lawrence route to Montreal are usually from one to two cents per bushel lower than those via Erie Canal route to New York and larger unit shipments may be handled.⁷ These advantages which result from the differences in distance, length of canals navigated, and channel depth and width, more than offset the advantages in ocean shipping at the port of New York. From the testimony of shippers it can be concluded that the low rate to Montreal has become one of the significant advantages to Chicago in handling export traffic. On both of these water routes the rates from Lake Erie to the sea are relatively much higher than the lake rates, reflecting the handicaps of these limited waterways.



FIGURE 18.—The small capacity of the St. Lawrence and the congestion at important points—Buffalo, Port Colborne, and Montreal—constitute serious handicaps to the use of the lake waterway for shipping grain from Chicago. Congestion at the lower end of the Lachine Canal, Montreal. (Courtesy of C. F. Jones.)

It is clear that the smallness of the savings effected by lake transportation, which is the principal factor limiting the use of the waterway for the grain traffic from Chicago, is dependent on the power of the railroads to make all-rail rates such as will permit them to compete with lake transportation (both lake-and-rail and all-water). The low all-rail rates have resulted not only from the competition of lake transportation but also from the keen competition between the trunk-line railroads, and between the different North Atlantic ports, and to some extent also, the competition of the Gulf routes.⁸ The right of the railroads to make rates competitive with those of lake transportation is recognized by the Interstate Commerce Commission chiefly on the basis of their demonstrated ability to compete for the traffic. This ability results from the fact that the costs of transportation from eastern lake ports to the seaboard, whether by rail or by water, form much the larger part of the combined costs of transportation from Chicago to the seaboard.

This emphasizes the great disadvantage to Chicago of the incompleteness, in

⁸ U. S. Industrial Commission, Report on the Distribution of Farm Products, pp. 111-113. (Washington, 1900): Daish, John B. Atlantic Port Differentials, 327, 328, 437, 460.

⁷ Chicago Board of Trade, Annual Reports; Lake Carriers Association (Cleveland), Annual Reports.

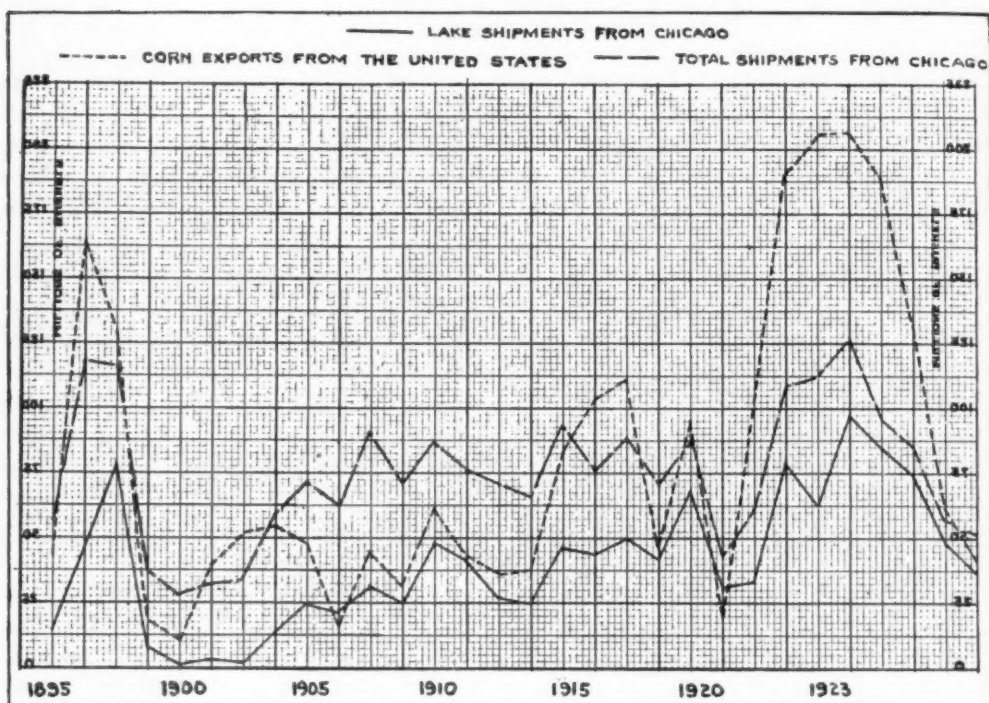


FIGURE 19.—The corn exports of the United States; the total shipments from Chicago; and the lake shipments from Chicago; all from 1894–1923. (Courtesy of Griffenhagen & Associates, Ltd.)

relation to the seaboard movement of grain, of the Great Lakes Waterway. Because of the small capacity of the New York State Barge Canal and the St. Lawrence Waterway there is no ship route from Chicago to the seaboard, and for export traffic, only a small vessel route to a single port closed for five months during the year. This lack of a through waterway for large ships is the most important factor limiting the use of lake waterway for shipping grain from Chicago (Fig. 18). Chicago is so much nearer by rail to the seaboard than the Lake Superior ports that all-rail rates can be made low enough to compete with the combined lake-and-rail rates and so handle much of the traffic which, at those ports, would be carried exclusively by lake.

The second major disadvantage of the lake waterway is the fact that it is closed because of ice during fully a third of the year. The closed season at Chicago is determined by the conditions in the

Straits of Mackinac, which are closed on the average, 118 days a year. Owing to the uncertainty of conditions in the Straits, grain shipments from Chicago are suspended for a slightly longer period, averaging 126 days. With respect to the traffic in wheat the importance of this handicap is lessened because little wheat needs to be shipped during the closed season, most of the receipts at Chicago being fall-sown wheat, harvested in the early summer, and ready to ship before the waterway is closed.

A minor factor affecting the use of lake and rail routes is the size of unit shipments of grain. The lake routes can better handle large shipments—a notable advantage in the export traffic, while rail routes are more advantageous for the small shipments which constitute most of the movement to the eastern markets.

The speed of transportation is normally a slight but probably unimportant advantage of the rail routes in competing for traffic. Of greater importance, es-

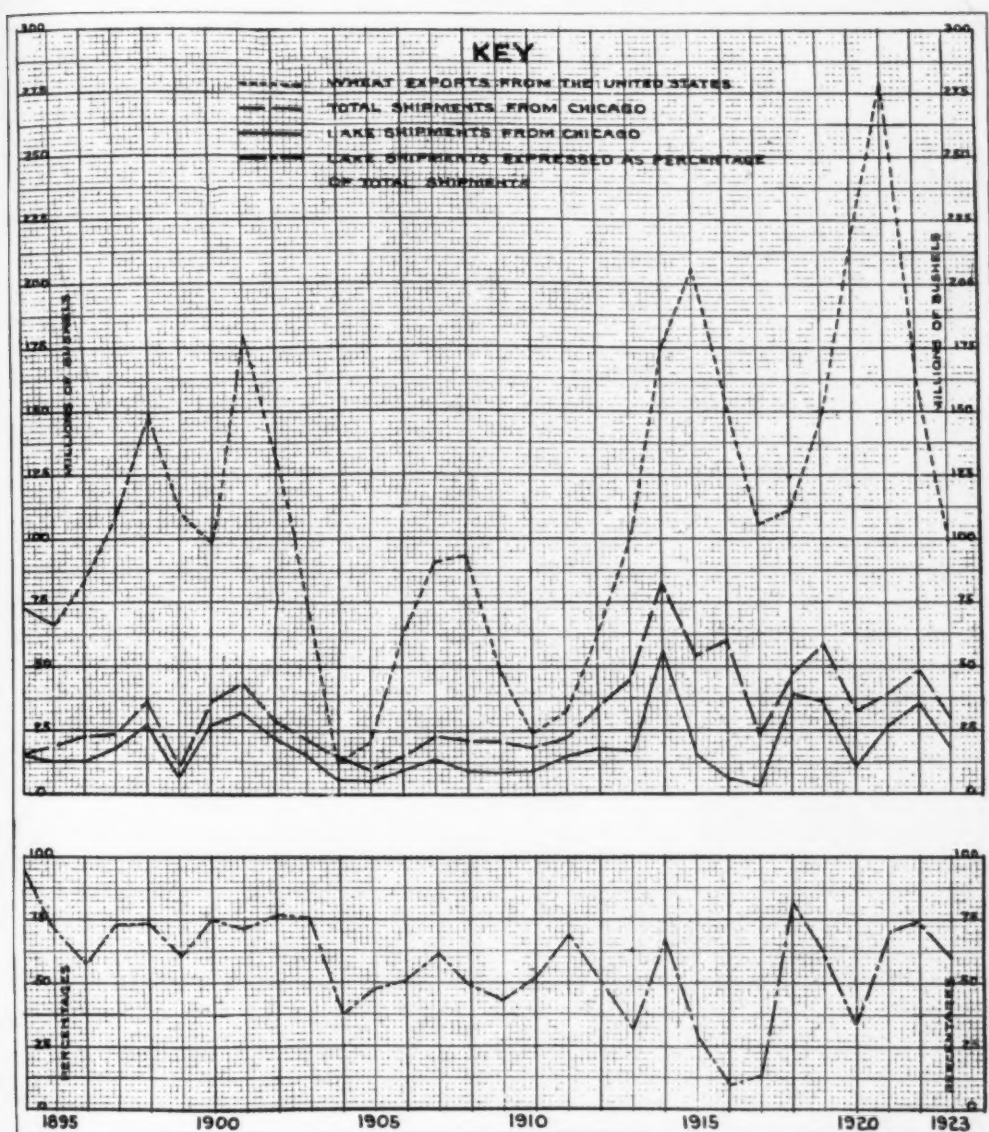


FIGURE 20.—Wheat exports of the United States and total and lake shipments from Chicago, 1894–1923, afford opportunity for studying the relatively minor importance of the interior metropolis as a wheat shipping center. (Courtesy of Griffenhagen & Associates, Ltd.)

pecially in the export traffic, is the advantage offered by lake transportation of forwarding grain to Buffalo, or other eastern lake ports, to be held for orders for later shipment over any of the many available routes. Available shipping space is nearly always greater in amount on the lakes than on the railroads, an important advantage in seasons of heavy movement, excepting when that results

in congestion at the transfer elevators, notably that due to the concentration of lake routes at Buffalo.

3. Marked Fluctuations in Lake Shipments

The third noteworthy condition shown by the statistics of lake shipments from Chicago is the great annual fluctuation, both in absolute amount and in the

proportion of the total east-bound shipments (Figs. 17, 19, 20). These fluctuations are due largely to the great fluctuation in the total movement through Chicago, resulting largely from varying conditions of production and demand, but are also due to a minor extent to variations in the export movement and in the conditions of transportation such as, lake rates, length of the open season, and railway and elevator congestion.

4. *The Trend in Lake Shipments*

Finally, average figures for five-year periods which largely eliminate the annual fluctuations, show clearly that there has been a decrease in lake shipments, both in absolute amount and in proportion to the total shipments, from the "peak" period just prior to 1900, to the "low" period of the War. Whereas at the present time but two fifths of the total east-bound shipments of grain from Chicago are handled by lake, prior to 1903 more than half the grain was so shipped, the proportion having declined from that time until just before the World War when but little over a fourth the movement went by lake. Though this situation has been generally recognized and its importance emphasized, it has not been adequately explained. The evidence available is insufficient to form a complete or final solution of the problem, but a number of significant factors generally overlooked may be pointed out, and an attempt made to evaluate all the factors.

The common explanation of the decrease in lake shipments rests on changes in railroad rates, all-rail and ex-lake. These are difficult to determine because of the discrepancies, prior to 1903 at least, between published rates and the actual rates charged. A careful study of the period 1890-1914 comparing the differences between the all-rail and lake-and-rail rates on wheat with the proportion of wheat shipments handled by lake showed but little relationship. However, it is probable, if not certain, that ex-lake rates have been relatively higher

since 1905 than before and that these have affected lake shipments, though to a less extent than other factors.

A major factor underlying the changes in relative importance of lake shipments is the variation in the total export movement from the United States (Fig. 19, 20). The decline in exports of each of the principal grains during the twenty years previous to the World War is paralleled by a decrease in the proportion of lake shipments. During the War, and as late thereafter as 1920, abnormal conditions were in control of shipping, but in subsequent years heavy exports have been accompanied by a higher proportion of lake shipments.

The greater advantage of lake transportation for exports as compared with domestic shipments is based on the large size of unit shipments, the ability to hold grain at eastern lake elevators for foreign orders, and on the economy of the all-water route to Montreal. Heavy lake movement of export grain also increases the lake shipments to domestic markets by making feasible the movement of additional small lots in vessels carrying large export consignments. The increased use of the Montreal routes for export in the last decade has largely offset the handicap to Chicago of the increased competition of the routes via the Gulf and all-rail routes passing south of Chicago to Atlantic ports.

An additional factor causing steady decline in lake shipments is the probable increased movement of feed grains to interior points east of Chicago.

The location of Chicago at the southwestern terminus of the Great Lakes Waterway functions in many ways as one of the most important advantages of that center in competing for the traffic in grain. (1) Lake transportation is of direct importance for only a part of the shipments and particularly for the export shipments so that its importance has, on the whole, decreased in recent decades with the decreasing export of grain from the United States. (2) The use of the lake waterway from Chicago is limited

because of its being closed during a third of the year, and to an even greater extent because of its incompleteness in relation to the Atlantic Seaboard. (3) In addition to the grain actually shipped by lake, a considerable amount is attracted to Chicago by the possibility of lake transportation, both because of its cheapness and because the addition of its facilities to those of the railroads centering at

Chicago makes that center preëminent among grain markets in facilities and routes. (4) Finally, the use and availability for use of lake transportation is one of the most important factors in maintaining the special rail advantages enjoyed by Chicago as the chief gateway between the surplus areas to the west and the consuming areas and export points on the Atlantic Seaboard.

THE GREEN COUNTY, WISCONSIN, FOREIGN CHEESE INDUSTRY

Glenn T. Trewartha

Geographer and Climatologist, University of Wisconsin

WISCONSIN is preëminently a dairy state, and cheese is her particular specialty. She far surpasses every other state in the quantity of cheese produced, manufacturing nearly three-quarters of the entire country's product. Within the state itself, cheese is the ranking dairy product, its factories utilizing 40 per cent of the commercial milk supply, although butter is a close competitor (Fig. 1). This quantity of milk is divided between American and foreign cheese in about the ratio of four to one. Nevertheless, Wisconsin has the distinction of producing a larger percentage of the country's foreign cheese (80 per cent) than she does of its domestic brands.¹

SPECIALIZED FOREIGN CHEESE AREAS

Three types of so-called foreign cheese, brick, Swiss and Limburger, are manufactured on a relatively large scale within the Badger State. Of these, brick is the most important. It is doubtful, however, whether brick cheese should be classed as a foreign type, for, as far as the author has been able to ascertain, it had its origin in Dodge county, Wisconsin. Its manufacture within the state is highly concentrated in the region of its origin, for Dodge county, and contiguous parts of adjoining counties, still produce nearly 75 per cent of the state's total brick cheese. Secondary centers are found in Barron and Green counties (Fig. 2).

The manufacture of the two other important types of foreign cheese produced in Wisconsin, Swiss and Limburger, is even more restricted in its

areal distribution than is the case with brick cheese. Ninety-six per cent of the Swiss, and 98 per cent of the Limburger cheese are made in Green county, where it was first manufactured in Wisconsin, and adjacent sections of La Fayette, Iowa, Dane and Rock counties, into which the Swiss and their industry have spread from the original Green county center. It is with this latter foreign cheese area of southern Wisconsin, embracing an area of less than 1,500 square miles, with Green county at its center, which in 1923 produced approximately 71 per cent of the country's Swiss, 45 per cent of its Limburger, and between 8 and 10 per cent of its brick cheese, that this paper is specifically concerned (Fig. 2).

AGRICULTURAL READJUSTMENTS WITHIN THE AREA

The area under consideration has passed through several phases of geographic adjustment to the physical, as well as to the changing economic environment. In this respect its history is similar to those of many other specialized dairy areas within the state. Dairying has not always held such a dominant position among the industries of the region. The evolution of its agriculture from the one-crop period when wheat was king, to the present status of dairy specialization, is a narrative of economic adjustments to the natural environment and to changing economic conditions.

The Wheat Period

Wisconsin, including the particular area under consideration, began its agricultural career as a wheat-growing region. In the states to the south and west the beef cattle industry preceded

¹ *Wisconsin Crop and Livestock Reporter*, vol. 3, no. 7, Sept., 1924, p. 30.

wheat. Wisconsin, with less prairie land, and with longer and colder winters, which necessitated better shelter and more winter feed for the cattle, was less well suited for a frontier cattle industry.

The rise of wheat culture in Wisconsin, and the supremacy of that crop in the state for several decades, was a response to the economic and geographic con-

profits than do the majority of crops and animal industries.

Wisconsin's temporary geographic-economic position, therefore, on the frontier of a westward advancing civilization, together with her rich virgin soils and her not unfavorable climate, made her temporarily a wheat state. The character of the physical environment was permissive so far as wheat growing was concerned, and even inviting in some parts, but not particularly more so than for many other crops and animal industries.

Substitution of Dairying for Wheat Growing

The decline of wheat culture in Wisconsin occurred when the frontier was pushed still farther westward beyond that state, carrying with it the conditions that had made wheat specialization profitable in a climatic environment of so high an order. With the advent of railways into the states beyond the Mississippi, the great open plains of Minnesota, the Dakotas and Kansas, regions of virgin prairie soils and light precipitation, became wheat-growing regions, and in competition with them, the industry on the more valuable lands of Wisconsin was severely handicapped. That the frontier did advance beyond Wisconsin testifies to the fact that her physical environment was capable of supporting a type of economic development more advanced than that which prevails in frontier locations.

During the early period of agriculture in any new area, many maladjustments and misfits of crops and industries to the natural environment may be expected; but as a region develops, the physical environment permitting, and better marketing facilities are established, the economic struggle becomes keener, and a finer adjustment to the environment takes place. Such a readjustment went on in the present Green county foreign cheese area, as well as in some other sections of Wisconsin, between 1870 and 1890, when wheat moved out and "other

COMMERCIAL USES OF MILK IN WISCONSIN-1923

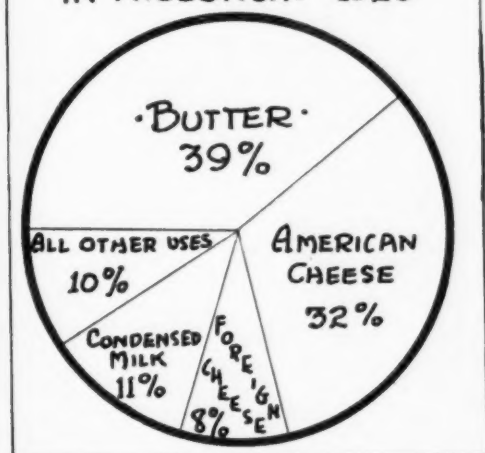


FIGURE 1.—Within the state of Wisconsin, cheese is the ranking dairy product, although butter is a close competitor. The rates of American cheese to foreign cheese is about 4 to 1 but the latter type is growing in importance. (Courtesy of Wisconsin State Dept. of Agriculture.)

ditions prevailing there at the time. The history of wheat culture in the United States has shown that, the natural environment permitting, it is a crop particularly adapted to frontier conditions, *i.e.*: cheap virgin lands, sparse population, scanty capital, inadequate storage and transportation facilities, and extensive methods of cultivation. As one writer has said concerning early Wisconsin agriculture, "Poor farming was the only profitable farming and consequently the only good farming. . . ." That is not to say that wheat does best under slovenly and unscientific conditions of agriculture, but only that under these conditions it returns larger

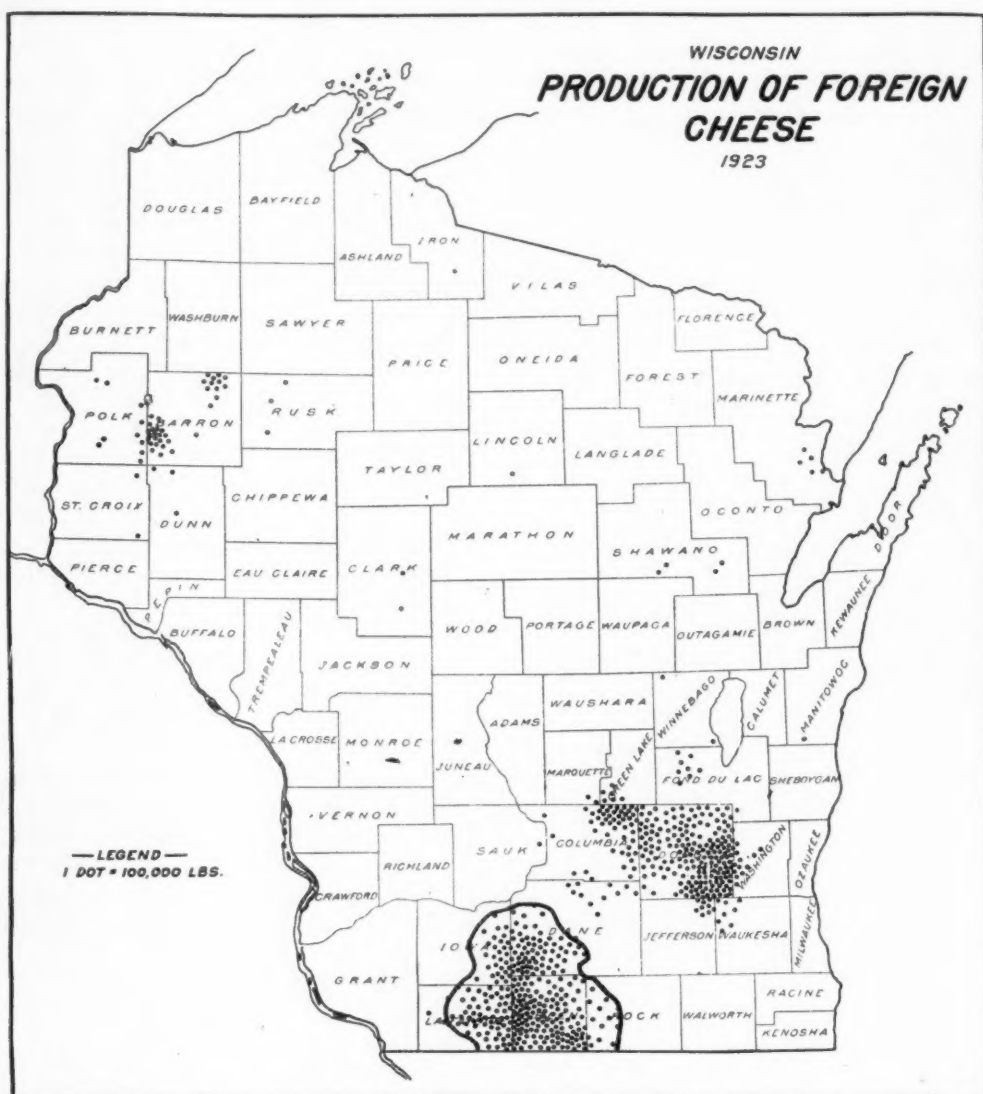


FIGURE 2.—The Green county cheese area of Wisconsin of which the limits are designated by a heavy black line; Green county is almost in the center of this area. The Dodge county brick cheese area lies northeast of the Green county area. (Map prepared by the Crop and Livestock reporting service of the State Dept. of Agriculture from records of Dairy and Food Commission.)

crops" and dairying came in to take its place. The environment of Wisconsin was, on the whole, of too high an order to allow wheat to remain, once the frontier had passed; for wheat grows well in regions of light precipitation where many crops cannot flourish. Most of the important wheat regions of the earth have an average annual precipitation of less than 30 inches. In competition with

more exacting crops, therefore, wheat was forced into the drier, less desirable lands farther west. Chinch bugs, exhausted soil, unstable markets, etc., all played a part in bringing about the downfall of wheat in Wisconsin at the time it occurred, but the characteristics of the environment seemed to foreordain that the state was destined for a higher type of agriculture than a one-crop

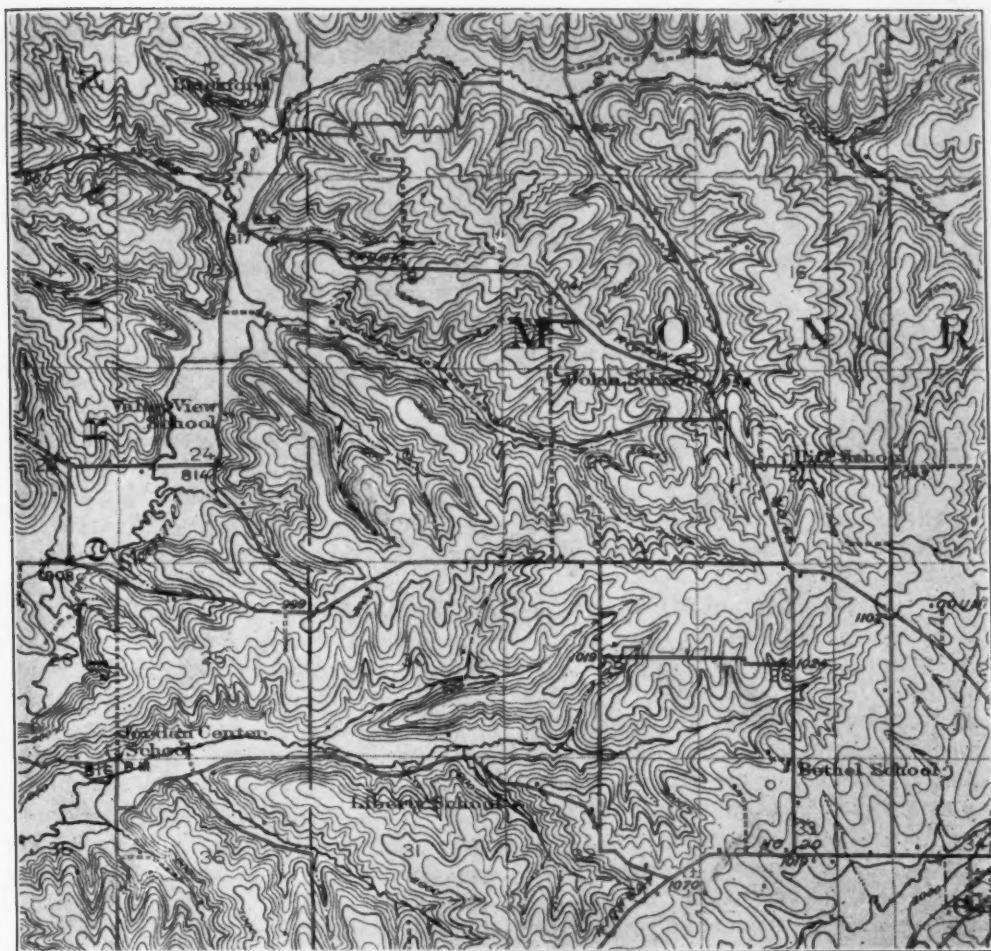


FIGURE 3.—A portion of the maturely dissected limestone upland of western Green county, north-west of Monroe. Dairying has reached the most advanced stage of specialization in regions of this type. The cross-roads factory is the most satisfactory adaptation to such environment, particularly relief. (Scale, ca., 1 mi. to the inch. Courtesy of U. S. G. S.)

wheat régime. Even had these temporary handicaps never occurred, it is contended that wheat specialization must very shortly have declined in the face of competition of crops and industries, representing a more satisfactory adjustment to the natural environment and to the changed economic conditions.

Not only was the nature of the physical environment an important factor in allowing a higher economic order to replace the frontier conditions, but it also acted in a positive way to discourage wheat culture. A large part of the Green county foreign cheese area is

within the unglaciated part of Wisconsin, where the slopes are frequently steep and the valleys narrow. Constant cultivation of these slopes is ruinous, for erosion removes the soil cover and gullies the fields. Large-scale, labor-saving farm machinery, such as can be profitably employed in the extensive agriculture of the western plains, is not suited to the rolling and angular topography of this dairy area (Fig. 3). Nor are the soils of the Green county region, thin in some parts, sandy in others, and in general having less humus than the darker, heavier prairie soils of the plains states,

as satisfactory for wheat culture as are the latter.

With the exit of wheat, followed by a short period of experimentation, the area entered upon a career in another specialized type of agriculture, the dairy industry. In this industry Green county and adjacent parts of Dane, Iowa and La Fayette counties, have achieved remarkable success, partly due to the fact that the environment in this region is of such a nature that the dairy industry seems to be a particularly happy adjustment to the natural physical conditions prevailing there. Environmental conditions are not usually insurmountable difficulties to man, but richer rewards are more frequently the result when human energies are coöperating with, rather than opposing, nature.

THE GENESIS OF DAIRYING IN GREEN COUNTY

It was a complex of social and geographical factors that started Green county upon its career as a specialized foreign cheese area. A predominantly Swiss population in a region physically inviting to dairying seems to have been the combination of factors that influenced the early development of Green county as a foreign cheese center. It is nearly impossible to compare the geographic and social factors quantitatively. The environment was in no sense compelling as far as the adoption of the dairy industry was concerned, for there are areas in Wisconsin very similar in physical characteristics to the central and western parts of Green county that have never become dairy centers. On the other hand, the first Swiss who settled at New Glarus, because of the frontier environment, became grain farmers, as nearly all of the other early settlers did, and it was not until the frontier had passed, and their impoverished and gullied fields brought them face to face with financial failure, that they turned from wheat and made dairying an important factor in their farm economy. Neither, therefore, was the social factor a compelling one.

The Social Factor or "Transported Geography"

Geographic, probably more than the sentimental reasons that are so frequently given, caused the Swiss colony to locate at New Glarus in Green county. Canton Glarus in Switzerland, from which the emigrants came, is one of the wildest and most mountainous states in that country, and any resemblance between the mountains of Old Glarus and the hills of Green county is small indeed. The two men who were sent out to America by the Swiss emigration society to select a suitable site for the new colony were instructed to purchase 1,200 acres of land in one body, in a healthful location where there was sufficient timber and good water.² Upon arriving in Chicago, the two emissaries went to the United States land office and examined the maps, but found that "nearly all the timber land in that land district was either preëmpted or sold, but a great amount of prairie land was yet open for entry." The same comment was made after they had examined the plat books in the United States land office at Dixon, Illinois, indicating how very necessary they considered timber land to be. After examining various locations in Rock, Dane and Sauk counties (Wisconsin), all of which were either already taken, or else lacked in one or more of the characteristics of the natural environment, as specified in the instructions of the emigration society, they finally settled upon a location in the valley of the Little Sugar River in Green county. In acquainting the emigration society in Switzerland with the purchase, John Duerst, one of the two emissaries, wrote, on August 19, 1845, "We have selected and bought what we believe to be a favorable point for settlement. The land lies eight miles from Exeter and

² John Luchsinger, "The Swiss Colony at New Glarus," *Wis. Hist. Coll.* VIII, pp. 411-439 (pp. 415-416). See also: (1) John Luchsinger, "The Planting of the Swiss Colony at New Glarus," *ibid.*, vol. XII, pp. 335-382, and (2) Theodore Rodolf, "Pioneering in the Wisconsin Lead Region," *ibid.*, vol. XV, pp. 338-339.

thirty-five miles from Mineral Point, where great markets are held. It contains mostly fertile soil, good water in springs and streams and sufficient forest."³

It is clear, then, that it was a favorable natural environment for a pioneer settlement which led the Swiss to settle at New Glarus, in Green county, in 1846. From this original settlement they have spread over much of central and western Green county, the southwestern part of Dane and the eastern parts of Iowa and La Fayette.

The Swiss are, as a rule, a hard-working, thrifty folk, economical almost to a fault. They did not shrink from drudgery and close application to business, which are the price of success in the dairy industry. The Yankee farmer often objected to being "tied to a cow." Besides being accustomed to hard work, the Swiss farmers were already acquainted with dairy farming and cattle raising, for these were of necessity the principal types of agriculture in the homeland. In the mountainous topography of Switzerland, the cultivation of crops on a large scale is impossible. But in the blue grass of the high, cool, Alpine pastures, the Swiss possess a natural resource capable of supporting large herds of dairy cattle during the summer months, and so the agricultural population has resorted to cattle raising and dairying. It has been suggested that the specialization in a hard compact cheese, which can be easily transported, and one which improves with standing and actually requires a long period of curing, represents an adjustment to the transportation difficulties under which the Alpine dairies labor in getting their products to market.

The Swiss who came to New Glarus, therefore, while they were not expert cheese-makers, had had first-hand acquaintance with dairy practices in the Old Country, and this earlier training and aptitude manifested itself in the quick shift to dairying in Green county,

as soon as economic conditions made it possible. The social factor, then, made itself felt through the particular bent of the people toward dairying, and their acquaintance with a particular type of dairy product, Swiss cheese, and these in turn reflect the characteristics of the natural environment in the homeland. This seems to be a clear case of what may be called "transported geography," or, the physical environment of a former homeland, acting indirectly upon the economic life of a new region, through emigration of a population whose industrial habits and practices have been colored by long residence in the mother country's environment. In this new light, therefore, the so-called social factor becomes geographic.

The Environmental Factor

The natural environment of a large part of Green county is inviting to the dairy industry. Only the extreme northeastern part was covered by the last glacial ice sheet, and a large part of western Green county is within the Driftless Area. As a result, the cycle of erosion is well advanced in the region, dissection is relatively great and steep slopes are abundant (Figs. 3 and 4). The upland soils, developed upon limestone, and with a loessial admixture, are remarkably fertile. In the valleys, where the streams have cut through to the sandstone, the soils are lighter and sandier in nature and, on the whole, less fertile. The eastern part of the county, which lies in the valley of the Sugar River, has relatively large areas of sandy outwash, where the price of farm land, nature of the crops, and general appearance of the farm buildings, reflect a poorer soil.

Wheat farming was first resorted to by the Swiss because that grain was particularly suited to frontier needs and conditions. This has already been elaborated upon in an earlier section of the paper. The slope farms, while they yielded abundant crops, were particularly subject to the handicap of washing

³Luchsinger, *op. cit.*, XII, p. 347.



FIGURE 4.—Characteristic topography of the western portion of the Green county foreign cheese area. Extensive areas of steep-slope land are unsatisfactory for cultivated crops. Grass on the slopes prevents rapid erosion, and furnishes pasture for the large herds of dairy cattle. (Courtesy of the Wisconsin Geological and Natural History Survey.)

and gulying. Constant loosening of the soil for crops put it in prime condition to be easily removed by slope wash and wet-weather streams, so that it was not long before the Green county wheat farmer found his soil becoming thin and the productive area of his fields reduced by gulying. These same hills, however, produced an excellent quality of blue grass, and sowing them to grass every few years in rotation with grain and forage crops had the added advantage of anchoring the soil on the steep slopes and preventing active erosion. A large number of cool springs in the hilly regions furnished an unsurpassed water supply for the dairy herds, and were almost invaluable in preserving and curing the dairy products. John Luchsinger writes concerning the natural advantages for dairying possessed by Green county, "Then, again, the land in this vicinity is on the whole better suited for such purposes than for tillage. The hill pastures, though scant, produce sweet and nutritious grasses, while the natural meadows

in the bottoms yield an abundance of good hay. Springs and streams of pure, cool water abound, almost every farm being supplied with running water."⁴

Grass, hay and forage crops, which are the mainstays of the dairy industry, find in the climatic, as well as in the topographic environment, of southern Wisconsin, conditions which react in their favor. The somewhat cooler and shorter summers in southern Wisconsin, compared with those in the Corn Belt, have tended to handicap the growing of corn for grain, but this same condition is quite satisfactory for silage corn, and it favors a more luxuriant growth of grasses. A larger percentage of Wisconsin's summer precipitation comes in light rains of longer duration and more prolonged cloud cover than is true of the Corn Belt states, where a smaller proportion of the warm season rainfall is of cyclonic origin. Grass, and forage crops in general, do better in the Wisconsin climatic environment, with its lighter,

⁴ *Wis. Hist. Coll.* XII, p. 339.



FIGURE 5.—A prosperous farmstead in the central upland of Green county. Large barns and holstein cattle are typical of the cultural landscape of this region. (Courtesy of U. of Wisconsin Photographic Lab.)

more prolonged rains, shorter growing season, and lower summer temperatures with more cloud. The ranking position of that state in the total number of tons of hay and forage produced, and in the number of silos as well, reflect crop adjustment to the physical conditions prevailing there.

GROWTH AND EXPANSION OF THE GREEN COUNTY FOREIGN CHEESE AREA

The shift from wheat to dairying was rapid in Green county. During the ten years following 1870 its wheat production declined from 525,190 to 192,982 bushels, and by 1880 wheat was no longer a prominent crop. The frontier was passing, and with it the conditions that made wheat growing profitable. In Green county the one-crop wheat régime was threatening the farmers with disaster. Together with this general dissatisfaction with wheat, which was very real by the period of the early seventies, there occurred at about this time several developments which were necessary to, and preparatory for, the large dairy expansion that was soon to take place. These developments were: (1) the introduction of the factory system for making cheese which made it possible to manufacture that product on a large scale, (2) the organization of dairy associations and dairy boards of trade

within the state and (3) the improvement of Wisconsin's economic-geographic position with respect to the large eastern and foreign markets through increased and improved transportation facilities. This included the establishment of trunk-line railways between Chicago and the East, the development of "through freight" and "fast freight" companies, and the perfection and successful employment of refrigerator-car service. By 1870 or 1875 the stage was set for the agricultural revolution in Green county.

Introduction of the Cheese Factory

Frederick Merk says that the introduction into Wisconsin of the factory system for making cheese was to the cheese industry of that state what the cotton gin was to the cotton industry in the south and the reaper to the western wheat states. The large production of dairy Swiss cheese in Green county prior to the introduction of the cheese factory indicates the tendency of the Swiss farmers to engage in dairying, even at an early period.⁵ As the cows multiplied in numbers, and the product of the farm dairies became too large for home consumption, markets were found at Galena, and Freeport, in Illinois, and at Madison,

⁵7,600 pounds in 1859 and 330,000 pounds in 1869.

Wisconsin.⁶ For twenty years the Swiss cheese industry remained in this household state. Toward the close of the sixties, the Green county farmers who had sown their hill farms to wheat for two decades were facing serious financial difficulties.

Swiss who had learned the art of cheese-making in Limburg, Holland. Upon emigrating to America he settled in New York State and made Limburger cheese there.⁷ Arriving in Green county in 1870, he built in that year, near the village of Monticello, the first cheese

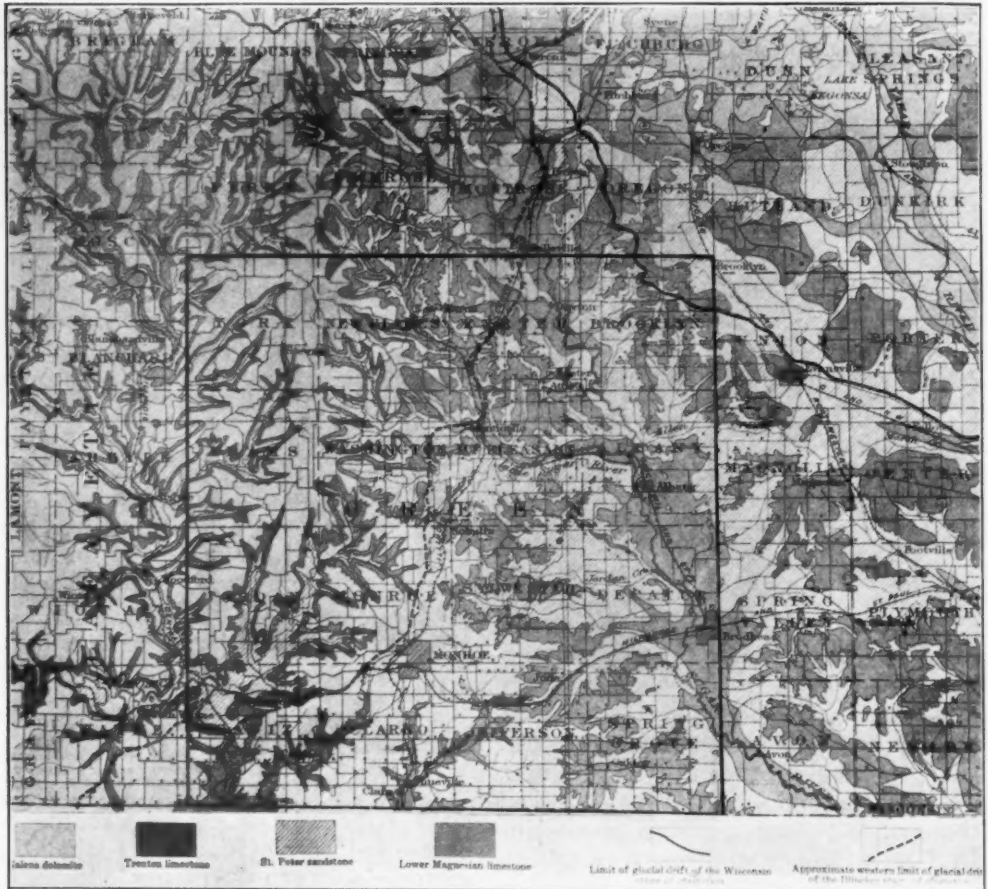


FIGURE 6.—Stratigraphy and geology of Green county and adjacent parts of adjoining counties. The boundaries of Green county are indicated by a heavy black line. (Scale, ca., 12 mi. to the inch. Courtesy of U. S. G. S.)

But help was near and it appeared in the form of a couple of cheese men from the East by the names of Gerber and Neumeister, who were instrumental in starting the factory system for cheese-making in Green county. Gerber was a

factory in the county. The product of this first plant was Limburger cheese, as might be inferred from the training of its owner. It is interesting to note that in a Swiss community, which had been making Swiss cheese almost exclusively

⁶Luchsinger, "The Foreign Cheese Industry of Wisconsin," *16th Annual Report of the Wisconsin Cheesemakers Association*, pp. 182-188 (p. 184).

⁷Personal interview with F. Gerber of Monticello, Wisconsin, son of Nicholas Gerber, who established the first cheese factory in Green county.

for over twenty years, that it was a soft, Dutch cheese that was first manufactured by the factory system. Henry Holdrich, a German from New York, was instrumental in introducing the manufacture of American cheese by the factory system into Green county. Thus it happened that Limburger and American cheddar cheese soon became much more important in this stronghold of the Swiss, and remained so for over a decade, than their own highly prized Swiss cheese, the product for which Green county is justly famous at the present time.

PRODUCTION OF FACTORY CHEESE IN
GREEN COUNTY IN 1873⁸

Total Limburger cheese	534,000 lbs.
Total American cheese	500,000 "
Total Swiss cheese	152,000 "
	<hr/>
	1,186,000 "

Establishment of Dairymen's Associations and Dairy Boards of Trade

One of the most serious handicaps which the early Wisconsin dairy industry suffered was the evil reputation that all western dairy products had upon the eastern markets. This reputation was by no means entirely undeserved, either. The dairymen's associations established in the state during the late sixties and seventies deserve the most credit for correcting this situation. Their educational work consisted of instruction in methods of manufacture, in teaching correct methods of curing and packing, of giving information regarding market conditions, the peculiarities of certain market demands, etc. "It was not a mere coincidence that Wisconsin cheese-makers first successfully invaded the East within a few years after the association (Wisconsin Dairymen's Association) was organized."⁹

Contemporaneous with the establishment of dairymen's associations, came the organization of dairy boards of trade,

whose function it was to bring together the producers of dairy products and the wholesale dealers, particularly the eastern and foreign buyers, so that they might bargain directly instead of going through the Chicago middlemen. Elimination of the Chicago commission merchant's fee was no small saving, as is indicated by the following quotation from one of Wisconsin's pioneer dairymen: "By shipping direct to New York we save on account of commission, a sum that may be reckoned equal to about \$200.00 on each car load."¹⁰

Improved Transportation Facilities

But even with a factory system which made large-scale production of dairy products possible, and dairy boards of trade and dairymen's associations which facilitated marketing, there still remained the serious obstacle of restricted markets. The geographic factor of distance which effectively separated Wisconsin from the large dairy markets of the East and abroad established a very real threat, in the form of overproduction, to an expanding dairy industry. Indeed the condition of overproduction did exist in the dairy markets of the Middle West during the early seventies, and with dire results. The rapid development of cheese factories caused an annual flooding of the St. Louis and Chicago markets in summer, with a consequent slump in cheese prices. In the summer of 1871 the condition was the worst it had ever been, and the prices for good quality cheese dropped to eight cents a pound.¹¹ Some of the cheese factories which had sprung up with such mushroom-like rapidity during the late sixties and early seventies were forced to go out of business, and the

¹⁰ Chester Hazen, *Annual Report of the Wisconsin Dairymen's Association*, 1874, p. 11.

¹¹ W. D. Hoard, *Second Annual Report of the Wisconsin Dairymen's Association*, 1874, p. 13:

"Owing to the stimulus derived from high prices during and after the war, cheese factories were erected throughout the state, until in 1872 their production was in excess of the retail demand upon which they almost wholly depended. During the previous summer a large number of factories sold their cheese as low as 8 cents, and the

⁸ *Annual Report of the Wisconsin Dairymen's Association*, 1874, p. 29.

⁹ Frederick Merk, *The Economic History of Wisconsin During the Civil War Decade*, p. 28.



FIGURE 7.—Holstein cattle are the most popular breed in the Green county foreign cheese area. They give large quantities of milk having a moderate butter fat, and a high casein content. (Courtesy U. of Wisconsin Photographic Lab.)

whole dairy outlook was disheartening. The panacea for this ill of overproduction was increased marketing radius which would allow Wisconsin to dispose of her dairy products in the East and abroad. The handicap of geographic distance which separated the producing and consuming areas of perishable dairy products could only be overcome by swift and cheap transportation with refrigerator service, and that type of service was not available until after 1870.

The first noteworthy improvement in rail transportation between the Middle West and the East occurred during the early sixties when numerous short railroad lines were consolidated into great trunk-line systems. Although this tended to eliminate the disadvantage of frequent transshipment which had been prevalent before, the movement of freight even by trunk lines was slow for perishable goods. In the middle sixties there was inaugurated the "through freight" and "fast freight" services between Chicago and the Atlantic Seaboard which further tended to break down the barrier of distance which separated these

sections. The "fast freight" companies owned a large number of freight cars which they contracted with the railroad companies to send quickly and directly from shipper to consignee. Star Union, one such company, advertised in Wisconsin papers in 1865, guaranteeing to have its cars carried from Chicago to Philadelphia in six days, to New York in seven and to Boston in eight, and a forfeit was allowed for every day's delay.¹²

The culminating improvement in transportation which allowed a widening of Wisconsin's marketing radius for perishable products was the development of refrigerator car service. Shipment of cheese from Wisconsin to New York in common freight cars had been costing two and one-half cents per pound. "It amounted to an embargo, it was impossible to take our cheese in hot weather and send it to New York in this way, and every farmer and every cow and every interest was dammed up against this untoward state of affairs."¹³ In 1874 it became possible for the first time to ship Wisconsin cheese to New York in refrigerator cars and at the low cost of \$1.00 per hundred pounds. This very reasonable rate was so favorable that Wisconsin cheese could be shipped to London and Liverpool for but little more

market was seriously glutted. It became evident that unless some practical plan was adopted whereby Wisconsin cheese could be advantageously disposed of in the great markets of the world and the prejudice dispelled which was so unjustly held against it, there must ensue a serious check to the further development of this highly important interest."

¹² *Wisconsin State Journal*, Feb. 13, 1865.

¹³ W. D. Hoard, *19th Annual Report of the Wisconsin Dairymen's Association*, p. 46.

than the New York product. With her improved economic and geographic position with respect to markets, and her cheaper lands and feeds, Wisconsin was now in a position to compete with the established dairy regions in the East for the trade of that part of the country and abroad.

The New Era of Prosperity in Green County

During the same decade (1870-1880) in which wheat was suffering such a serious decline in Green county, the

pounds.¹⁴ Under this new régime of farming Green county enjoyed renewed prosperity. The following quotation was written in 1881 by an inhabitant of Green county, who was an eyewitness to the results of the agricultural changes that were taking place: "Lands that under the reign of grain growing were rapidly becoming worthless and whose owners were on the verge of financial ruin, have been reclaimed, and the good substantial improvements that are made (and the advance in the price of lands) show that genuine prosperity has followed in the wake of dairy farming, and

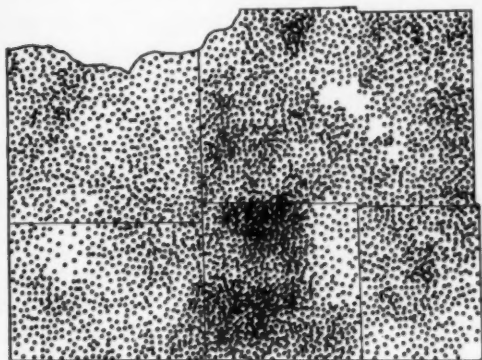


FIGURE 8.—Distribution of dairy cows in Green county and the adjacent counties. One dot represents 50 cows.

cheese industry was making important forward strides. By 1880 there were probably 70 cheese factories in the

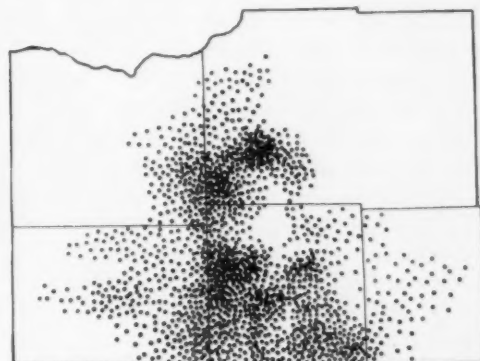


FIGURE 10.—Distribution of foreign cheese within the Green county foreign cheese area. One dot represents 20,000 lbs.

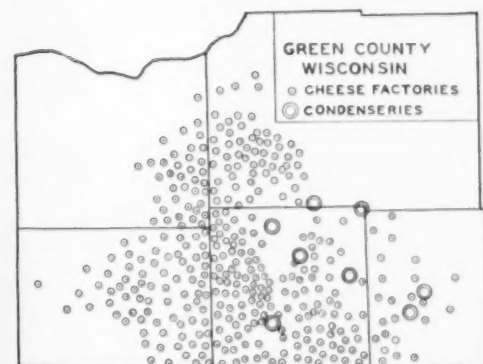


FIGURE 9.—Distribution of cheese factories and condenseries within the Green county foreign cheese area.

county, and their product amounted to between 4,000,000 and 5,000,000

that the owners from being habitual borrowers have become well to do having money to pay as they go and some to lay aside for a rainy day,—for the farmer in a hilly country, the *cow path* has (strange as it may seem, but none the less true) become the highway to prosperity."¹⁵ Luchsinger speaks of the bulk of Green county's cheese being produced in what he chooses to call the "cheese country." This he defines in a general way as the region northwest of a line drawn from

¹⁴ John Luchsinger gives the following data for Green county's cheese industry in 1882, *Tran. Wis. State Agric. Soc.*, 1882-1883, p. 274:

	Factories	Pounds
American cheese	15	1,450,000
Swiss cheese	16	400,000
Limburger cheese	42	2,400,000

¹⁵ John Luchsinger, *Tran. Wis. State Agric. Soc.*, 1881-1882, pp. 181-182.

the northeast to the southwest corner of the county. "This section was the roughest, wildest portion of the county, full of hills, but containing excellent pastures, and springs and brooks of clear cool water without number . . . on the whole, a tract of country unsurpassed for dairy purposes."¹⁶

*Expansion of the Foreign Cheese Area
into Dane, Iowa and La Fayette
Counties*

By 1890 those parts of Dane, Iowa and La Fayette counties adjacent to Green, had likewise become dairy areas. That this was but an enlargement of the Green county cheese district is testified by the fact that the product of the factories in these new areas was largely foreign varieties of cheese. The characteristics of the natural environment invited this expansion. The western Green county, "cheese county," with its much dissected driftless topography, good limestone and loessial soils, splendid natural pasture lands, and numerous springs, was nearly duplicated in these new cheese regions. The whole foreign cheese area was almost a physical unit, possessing similar handicaps for grain farming, but, on the other hand, similar advantages for the dairy industry. Disaster had threatened the wheat farmers of Dane, Iowa, and La Fayette counties, as it had the Green county grain farmers, but the latter were finding a way out of their dilemma. Clearly the renewed prosperity of Green county was the result of a change from wheat to dairying. It is not surprising, therefore, that these adjacent regions, with similar environmental conditions, should adopt a similar remedy for their ills.

It seems likely that a filtering over of Green County Swiss into the adjacent townships of Dane, Iowa and La Fayette counties was also a positive factor in bringing to these regions the new type of agriculture. The Swiss element in the population acted as a leavening influence among the other farmers in inducing the

change to dairying. The concentration of Dane, Iowa and La Fayette counties' Swiss population in these townships most adjacent to Green county, clearly indicates the source of the migration. It is possible that geographical proximity may deserve the entire credit for this combination of Swiss population and foreign cheese in those parts of La Fayette, Iowa and Dane counties bordering on Green. The fact that there was not the same migration of the Swiss people, nor a similar expansion of the foreign cheese industry, into the sandier, and for the most part poorer, soil areas to the east and northeast in eastern Green and western Rock counties, suggests that the much dissected, driftless limestone area to the west and northwest was preferred. Sandy soils in Wisconsin are usually droughty and of low fertility, and as grassland soils they are particularly undesirable. That quality reacts against their becoming important dairy regions.

THE PRESENT DISTRIBUTION OF DAIRY
PRODUCTS IN THE GREEN COUNTY
FOREIGN CHEESE AREA

Foreign cheese and condensed milk are the two major dairy products produced in the area under consideration. Over the whole area the latter product would rank a rather poor second, yet in certain years, as, for instance 1921, the value of condensed milk has exceeded that of cheese in Green county.

Condenseries

The first condensery in Wisconsin was located at Monroe, the county seat of Green county, in 1889. Since that time seven others have located in, or on the margins of this foreign cheese area, four of them in Green county. As a result of condensery competition, many cheese factories in the immediate vicinity of these large plants have been forced to close. Between 1910 and 1923 the number of cheese factories in Green county declined from 213 to 149, and at least a part of this decrease was due to con-

¹⁶ *Ibid.*, 1882-1883, pp. 274-275.



FIGURE 11.—Typical cultural landscape in a district of mature dissection in the western part of the Green county foreign cheese area. (Courtesy of U. of Wisconsin Photographic Lab.)

densery competition. At the present time there is scarcely a cheese factory within a radius of five miles from New Glarus, the home of the original Swiss settlement, where there is at present a condensing plant.

Condenseries, because of the size of the establishments and their requirements of a large volume of milk, adequate means of waste disposal, large supplies of water, and close proximity to a railroad in order to get their products to market, cannot be located at any cross roads as can a cheese factory. The requirement of a large milk supply from a relatively small area makes it likely that condenseries will select old, well-established dairy districts, where there is a relatively large cow population. Transportation, both rail and highway, is a much more important factor in determining the sites of these large establishments than is the case with the cheese factory. Condenseries are forced to draw their milk supplies from relatively great distances, frequently 10 to 15 miles. Thus the item of general road conditions, in its influence upon the ease or difficulty of local hauling by wagon or auto-truck, affects the location of condensery sites. The need of a large supply of water, and adequate means of waste disposal, induce condenseries to locate in cities or villages where the city water supply and sewage systems can be utilized.

An analysis of Figure 9, showing the distribution of dairy establishments within the area being considered, indicates to what a considerable extent the previously stated requirements have influenced the location of the condenseries. All of them are in cities and villages served by railroads, and in a section of the area where better road conditions prevail. The rugged and much dissected driftless territory of southwestern Dane, eastern Iowa and La Fayette, and western Green counties, with its poorer rail and highway service, has remained the stronghold of the small cross-roads cheese factory. Numerous small establishments thus located make long hauls unnecessary, and in such a region the local transportation factor becomes an important item. On the other hand, there is a noticeable concentration of condensing plants in central Green county and on the eastern margins of the foreign cheese area in western Rock and eastern Green counties. In the latter region the Sugar River and a pre-Wisconsin ice sheet, plus the outwash from the Wisconsin glacier, have reduced the topography to a condition of later maturity, and local transportation is less of a problem (Figs. 11 and 12). Available road building materials in the form of glacial gravels have likewise influenced the improvement of highways and the building of all-weather madacam roads.

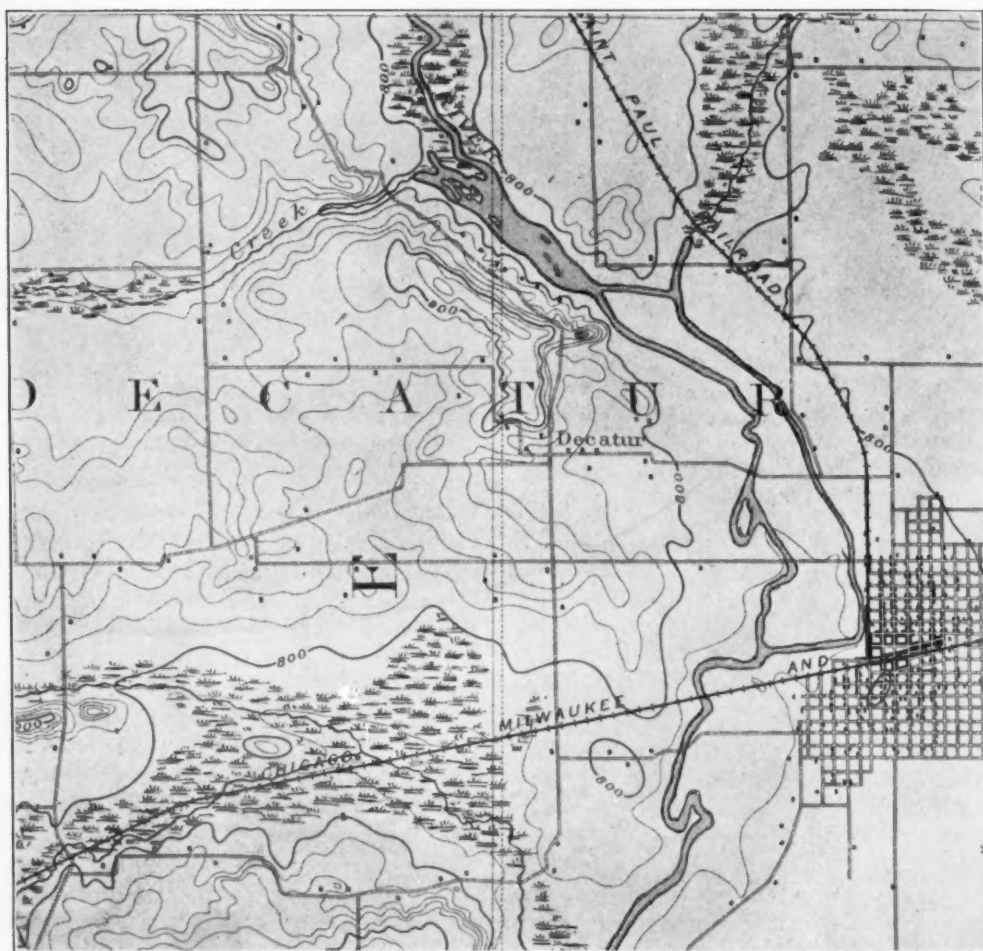


FIGURE 12.—A section of eastern Green county just west of Brodhead; the relief has been considerably reduced and light sandy soils derived from the underlying sandstone and the glacial outwash, prevail. In this region dairying has not been pursued with the same vigor as it has been in the dissected upland to the west. (Scale, ca., 1 mi. to the inch. Courtesy of U. S. G. S.)

The soils of the region, on the whole, are light and sandy in nature as a result of large exposures of St. Peters sandstone at the lower elevations and the sandy outwash which fills the river valleys. This soil condition makes itself felt in the less intensive development of the dairy industry, which is verified by the map showing the distribution of dairy cattle (Fig. 8). The Swiss have not migrated in this direction in the same numbers that they have to the hillier limestone districts west of New Glarus and Monroe. As a consequence the foreign cheese industry has not prospered.

In central Green county the relief on the whole is not as great as it is both to the east and west. The Madison-Freeport branch of the Illinois Central Railroad follows this route of less resistance and along its route at New Glarus, Monticello and Monroe, condensing plants have been established. It is one of the most specialized dairy sections within the foreign cheese area, formerly devoted almost exclusively to the manufacture of cheese, but more recently the milk supply has been divided between condenseries and cheese factories. In that part of Green county lying between

Monroe and the Sugar River valley where the western tributaries of that stream are working back into the limestone upland, condenseries have not located, and small cheese factories become common features of the cultural landscape.

Types of Foreign Cheese

The three types of cheese produced on a large scale in the area being considered are, in order of importance, Swiss, brick and Limburger. Brick cheese only in a few instances is the sole product of a factory, but is usually made in conjunction with Swiss, and more infrequently with Limburger. The large drum Swiss, which is very exacting in its requirements, and difficult to make, is frequently produced during the late spring and the summer, when the cows are on grass and there is the largest flow of milk. During early spring and late fall when the quantity of milk supplied to the factories is too small to make a large drum Swiss, brick or block Swiss are more likely to be the products. Limburger is frequently the sole product of a factory, although in a number of instances Swiss and Limburger are combined.

The distribution of the factories making these various types of cheese within the foreign cheese area does not seem to be influenced to any extent by natural environment. It has been suggested that Swiss cheese is more frequently the product of the limestone uplands, while Limburger, more often than Swiss, is from the supposedly more sour grasses of the sandstone lowlands.¹⁷ To better the study of the problem, the locations of the cheese factories of Green county were accurately plotted upon a large county map (one inch to the mile), upon which the areal geology had been sketched. The completed chart would scarcely allow one to conclude that stratigraphy was a controlling factor in the distribution of the various cheese types in

Green county. Further investigation of the problem in the field has led the author to the same conclusion.

Present Boundaries of the Foreign Cheese Area

To the northwest in Iowa county this foreign cheese district comes in contact with the expanding American cheese area centering in Richland county. To the west and southwest in La Fayette county, it merges into the mixed butter and American cheese district of western La Fayette and eastern Grant counties. This latter region has been more of a corn, hog and beef cattle district, but of late years there has been a drift to a mixed type of dairying. A little foreign cheese is made in northern Illinois, just across the state line from Green and La Fayette counties, but in that direction foreign cheese also gives way to more of a mixed type of dairying. On the east, the area is being encroached upon somewhat by condenseries, but in that direction the sandy character of the soils has discouraged the expansion and intensification of the foreign cheese area. Farther east in Rock county, a larger percentage of the milk is utilized by condenseries and creameries. To the northeast in Dane county, foreign cheese manufacture is largely confined to the rugged driftless area. This may be due entirely to geographical proximity to Green county, but on the other hand the small cross-roads cheese factory seems like a better adjustment to such an environment. Beyond the driftless area in Dane county the milk is utilized in various ways; some is condensed, a few local creameries take a portion of the supply, and a considerable quantity is shipped to Madison in the form of cream or fresh milk.

SUMMARY

Natural environment has played an important, but not always a dominant rôle, in the economic adjustments that have occurred in the Green county foreign cheese area. The environment was permissive as far as wheat was concerned,

¹⁷ See *Bulletin* 223 of the Agricultural Experiment Station of the University of Wisconsin (1912).



FIGURE 13.—Landscape more typical of the part of Green county where the relief is more nearly that of a plain. Lighter soils are characteristic and dairying is less intensively developed. (Courtesy of U. of Wisconsin Photographic Laboratory.)

but only so long as frontier conditions prevailed. Once the frontier had passed, wheat was no longer popular. Not only was the topography positively antagonistic to grain farming, but the climatic and locational factors in the environment were of too high an order to allow such a region to profitably compete in wheat growing with the drier and less valuable lands of the West, which were farther away from the great markets.

A combination of social, economic and geographic factors, determined the character of the new type of agricultural adjustment which followed the wheat-growing period. The Swiss element in the population was a strong positive factor in initiating the change to dairying and in assuring it continued success. They had located in Green county because the natural environment contained those elements which they considered as essential in founding a new home on the frontier. Adjusting themselves to the economic and geographic conditions prevailing on the frontier, they became wheat farmers. Later, abandoning wheat as an uneconomic use of their lands, the Swiss quite naturally turned to the dairy industry, a type of agriculture which the mountainous environment of the fatherland had fostered among its inhabitants.

The growth and expansion of the cheese industry in Green county after about 1870 was made possible by certain economic and geographic changes, prominent among them being the introduction of the factory system for making cheese, and improved transportation facilities which gave the region access to the great eastern and foreign markets. A third factor that has been important in the continued growth and success of the dairy industry in the region is the characteristics of the natural environment. From the standpoint of both theory and practical experience, the cheese industry seems to be a near approach to an ideal adjustment in such an environment.

A real expansion of the foreign cheese industry has taken place in all directions from the Green county center, but particularly to the northwest and west where the rugged topography is more partial to dairying, and especially to the numerous small establishments which are so characteristic of the foreign cheese industry. Toward the eastern margins of the area, where the relief is less and the soils are sandier, all forms of dairying are less important. In this direction condenseries have been making inroads upon what was originally foreign cheese territory.

BOOK REVIEWS

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce.

Recent studies in foreign trade and new surveys of foreign countries.

Commerce Reports. Weekly survey of foreign trade. The issue of *Commerce Reports* for February 8, 1926, illustrates the comprehensive and pertinent material of a world-wide nature which is carried in this weekly trade journal of the Bureau of Foreign and Domestic Commerce. First appears a summary by countries of the world's commercial news in brief. This presents a bird's-eye view of financial and economic conditions covering the entire world for the week preceding issue. Much of the information from foreign countries was received during the first week in February by cable from commercial attachés of the Department of Commerce and Consular Service of the Department of State. The foreign trade of the United States in 1925 is analyzed carefully and in an interesting fashion, and when it is realized that this article is appearing within five weeks of the close of 1925, its timeliness is evident. Other articles covering the foreign trade of Japan and of Great Britain for 1925 are equally valuable, while discussions relating to American exports of automobiles, paper, lumber, cotton cloth, exports of Canadian rubber and to the Mexican production and consumption of petroleum, the coal situation, and exports of foodstuffs for 1925 form a collection of up-to-date material which cannot be obtained elsewhere. An annual subscription to this weekly trade journal costs \$4.

Peru, a Commercial and Industrial Handbook. Trade Promotion Series No. 25; price, \$1.25. This handbook by W. E. Dunn, Commercial Attaché at Lima, fills a gap in commercial and geographic literature. It contains a graphic description of Peru, its climate, surface, and producing regions, both for crops and minerals. Transportation facilities and commercial relations are treated in detail. Maps have been prepared from the best Peruvian sources, showing towns, railroads, mountain regions, and forest areas.

Turkey, a Commercial and Industrial Handbook. Trade Promotion Series 28; price, 75 cents. There is no country about which it is more difficult to obtain reliable information than Turkey. Information on this area is in foreign languages, much of it in Turkish. Little has been assembled where it is available, consequently this description of Turkey will be especially helpful to geographers, economists and exporters. The text includes an excellent description of the country, sufficiently detailed in character to present a clear idea of conditions in both inland and coastal Asia Minor. Maps indicate the location of the more important mineral deposits and enable the reader to locate areas mentioned in the text.

Present conditions are pictured clearly, thus enabling the geographer or the business man to estimate the potential market for American goods and what type of commodity we may expect to obtain from this area.

OTHER HANDBOOKS

The above two handbooks are the latest contributions to a series issued by the Department of Commerce. This series provides information not available elsewhere regarding these countries. The authors of these volumes have represented the Department of Commerce in the countries about which they are writing and have become thoroughly conversant with the land and its people, together with their economic, political, and social possibilities for development. Some of these handbooks are listed:

Netherlands, East India and British Malaya. Special Agents Series; price, \$1.00.

Australia. Special Agents Series 216; price, 75 cents.

Rumania. Special Agents Series 222; price, 65 cents.

Mexican West Coast and Lower California. Special Agents Series 220; price, 85 cents.

Venezuela. Special Agents Series 212; price, \$1.00.

Colombia. Special Agents Series 206; price, 70 cents.

Bolivia. Special Agents Series 208; price, 65 cents.

Switzerland. Special Agents Series 210; price, 40 cents.

TWO SIGNIFICANT STUDIES IN RUBBER PRODUCTION

Plantation Rubber Industry in the Middle East.

Trade Promotion Series 22; price, 50 cents.

Rubber Production in the Amazon Valley.

Trade Promotion Series 23; price, 65 cents.

These studies, together with those issued earlier on the same subject, are the result of detailed but extensive field work carried on by the Department of Commerce with the coöperation of scientists from other government departments. Considerable time was spent in the field making a careful investigation of potential rubber producing areas, as to their soils, climate, relation to market, labor supply, and other conditions which might influence their possibilities for profitably growing Para rubber. The bulletins summarizing the field work therefore are distinct contributions of practical scientific value. Many maps, graphs, and pictures illustrate the text. Statistics of production and trade are presented and a bibliography is given at the end of each book.

International Trade in Cotton. Trade Promotion Series 13; price, 15 cents. Cotton, from the point of view of international trade, is the most important of all agricultural products. This in-

ternational movement is of particular importance because the largest part of the crop is consumed in countries widely separated from those in which it was grown. It is the most valuable commodity among exports from the United States. Major aspects of export and import trade in raw cotton are given, also a brief summary of that in cotton piece goods and cotton yarn.

Currency, Banking, and Finance in China. Trade Promotion Series 27. Facts relating to the monetary systems of China, banking and investment possibilities, and public finance hitherto have not been easily available to the geographer, economist, or business man. This comprehensive study has been made by Frederic E. Lee, who was formerly American Economist Consul in China, and in a position to know the most significant facts regarding financial relations. He discusses such subjects as the currency systems in China, foreign and domestic exchange in China, operation and function of Chinese "cash shops," the problem of currency reform, Chinese banks and banking, foreign banks and branches, a list of which is given, banking laws, regulations, and treaty stipulations, banking practices and the financing of foreign trade, investment banking and investments in China, public revenue and expenditures, China's national debt, foreign loans, foreign financial assistance and control. Appendixes list the Chinese banks distributed according to provinces, member banks of the Chinese banking consortium, the articles of incorporation of the Chinese-American Bank of Commerce, list of China's loans (foreign and domestic), and status of the Chinese telegraph and telephone loans.

Commercial Travellers' Guide to Latin America. Miscellaneous Series 89; price, \$1.25. This volume already has run through two editions. The present is a complete revision bringing maps and textual material down to date. It is a handbook which can be used by the traveler on his journeys or by any one who wishes to know conditions in the various countries of Latin America. This third edition has a new feature in the form of city maps for the more important urban centers. Reference maps also are given.

ANNUAL PUBLICATIONS

The *Commerce Yearbook* (price, \$1.00) provides a reliable and carefully balanced analysis of foreign trade conditions throughout the world. It contains commodity studies, economic reviews of many foreign countries, and a detailed discussion of foreign trade. The *Statistical Abstract* (price, \$1.00) is a compilation of statistical material collected from a wide range of government and private sources. It is a valuable statistical reference volume.

Commerce and Navigation (price, \$2.00) provides complete statistics of the foreign commerce of the United States by commodities, customs districts, and countries of origin and destination.

TRADE INFORMATION BULLETINS

Price, 10 cents each

- 360 *Markets in Bolivia.*
- 364 *Foreign Trade of the U. S., Fiscal Year 1924-25.*
- 365 *Rubber Industry and Trade of Japan.*
- 366 *Markets for Agricultural Implements and Farm Machinery in Argentina and Uruguay.*
- 367 *French Iron and Steel Industry.*
- 368 } *The Lead Industry: North America, South America.*
- 377 } *Oceania, Europe, Asia, Africa.*
- 372 *Fertilizers: Some new factors in Fertilizer Production and Trade.*
- 373 *International Trade in 1924.*
- 377 *Trading with Malaysia.*
- 378 *Forest Resources of Siberia.*
- 381 *Travel Routes and Costs in South America.*
- 382 *Investments in Latin America—Uruguay and Paraguay.*
- 383 *Machinery Markets of Brazil.*
- 384 *Argentine Markets for U. S. Goods.*

Paper Wrapper Packages for Parcel Post and Express Shipment. Domestic Commerce Series, free.

Taking Your Car to Europe. Customs entry, baggage exemptions, local touring regulations. Foreign Tariff Series 41; price, 10 cents. Touring in the United States has attained widespread popularity. This bulletin tells how the motorist may travel in Europe with his own car as comfortably as he does in America. It covers customs procedure for each European country, lists foreign currencies, gives names of foreign touring clubs, and explains road regulations in each country.

All of these publications may be obtained from the Superintendent of Documents, Washington, D. C., or from the district offices of the Bureau of Foreign and Domestic Commerce, which are located in the principal cities of the United States.

HELEN M. STRONG.

SCHURZ, WILLIAM L.; HARGIS, O. D.; MARBUT, C. F.; and MANIFOLD, C. B.; *Rubber Production in the Amazon Valley.* viii and 369 pp.; maps, diagrs., ills., index. Trade Promotion Series No. 23, Crude Rubber Survey, Bureau of Foreign and Domestic Commerce, Washington, 1925. 9 x 6 in. 65 cents.

Rubber Production in the Amazon Valley, prepared under the direction of H. N. Whitford, Chief, Crude Rubber Section, Rubber Division, as part of the survey of Essential Raw Materials, portrays the present status of the once notable wild rubber industry of Brazil and deals with the physical, economic, political and social factors that have a direct bearing on the possibilities of establishing rubber plantations in the several political units of the Amazon Valley.

The report consists of two parts. In the first part the authors relate briefly the history of the Amazon rubber industry from the beginning about 100 years ago to the great boom in 1910 and the crisis which followed in the wake of the inflated rubber bubble. They describe the present state of the wild rubber industry and show clearly the decreasing part which this industry is to play in supplying the world with rubber: while the Amazon Region contains some large unexplored rubber areas, the wild or native rubber industry is destined to be of minor importance, since wild rubber itself no longer constitutes a determinant factor in the world market and since its production depends primarily on the trend of market prices. They analyze the possibilities of plantation rubber, both from the standpoint of the physical and economic factors which have a bearing upon the industry. In the final section of part one they give a brief but vivid comparison of the physical, economic, and political conditions of the Amazon Valley with those of the Middle East, from the viewpoint of rubber planting.

In the second part of the report, the subject is treated in nine regions, seven of which are in Brazil, one in Bolivia, and one in Peru, Ecuador, and Colombia. In each of these sections one finds a clear and concise treatment of the physical features, climate, vegetation, population, and economic conditions favoring or discouraging the development of either a wild or plantation rubber industry. The proper combination of the elements of the natural environment for rubber production exists over large and contiguous areas of the Amazon Valley. These areas lie both in regions easily accessible and in regions at present lacking adequate transportation facilities; some sections have laborers of good physique inured to exposure and with proper care and incentive capable of long-continued work; other regions are uninhabited, except for a few backward Indians.

While the main theme of this publication is "Rubber Production in the Amazon Valley," the authors have made other notable contributions to our knowledge of the physical and economic geography of this little known but much talked of region. In this field "Soils of the Amazon Valley" by C. F. Marbut and C. B. Manifold (pp. 55-75), "Topography" in short sections throughout the volume (pp. 50-53, 156-159 for example), "Climate" (pp. 77-84, 217-219 and others), "Vegetation" (pp. 94-98, 165-168, etc.), "Other Industries and Resources" and "Transportation and Communication" deserve special mention. Some of the best information available on crops and animals in the Amazon country is included in the several sections on "Other Industries and Resources."

The volume, an outgrowth of a detailed piece of field investigation by a group of specialists in different yet related fields, is of special value to the geographer.

CLARENCE F. JONES.

JEFFREY, EDWARD CHARLES. *Coal and Civilization*. ix and 178 pp.; many illustrations. The Macmillan Co., New York, 1925. 7½ x 5½ in. \$2.50.

HAMILTON, WALTON H., and WRIGHT, HELEN R., with the aid of the Council and Staff of the Institute of Economics. *The Case of Bituminous Coal*. xi and 307 pp.; graphs, bibliography, glossary and index. The Macmillan Co., New York, 1925. 7½ x 5½ in. \$2.50.

UNITED STATES COAL COMMISSION, THE STAFF OF. *What the Coal Commission Found*. Edited by HUNT, EDWARD E.; TYRON, F. G.; WILLITS, JOSEPH H. 416 pp.; diagrams, charts, tables. The Williams and Wilkins Co., Baltimore, Md., 1925. 8½ x 5½ in. \$5.00.

ASHTON, THOMAS SOUTHCLIFFE. *Iron and Steel in the Industrial Revolution*. x and 265 pp.; maps and ills. Longmans, Green & Co., New York, 1924. 8½ x 5½ in. \$5.75.

GREER, GUY, with the aid of the Council and Staff of the Institute of Economics. *The Ruhr-Lorraine Industrial Problem*. xiv and 328 pp.; map. The Macmillan Co., New York, 1925. 7½ x 5½ in. \$2.50.

MOULTON, HAROLD G., and LEWIS, CLEONA, with the aid of the Council and Staff of the Institute of Economics. *The French Debt Problem*. xii and 459 pp.; charts. The Macmillan Co., New York, 1925. 7½ x 5½ in. \$2.00.

This group of six books, all valuable contributions to the literature relative to the coal industry, should find a place on the shelves of every public and institutional library, and in the home library of every citizen who wishes to keep in step and touch with the march of industrial progress. All these books not only bear directly upon the coal industry, but constitute an up-to-date series that helps to explain a great deal of the social, industrial, and political history that is being made in this century and that has been made for a hundred years or more past.

The average citizen realizes rather indefinitely that the industrial and social unrest, the realignment of economic and political powers, the seething activity in the international cauldron, and even the world war, find their explanation in the industrial revolution that began over a century and half ago; if every American were to read these six books he would know very definitely and very fully the essential facts in the sequence of events that have happened within his lifetime, and understand much more thoroughly some of the changes that are happening now, or seem to be impending.

Coal and iron, and their relationships to one another in directing human industry and shaping human history for more than a century, comprise a team of resources that seems to have run away with civilization and amuck among human ideals.

Their occurrence in vast quantities in proximity to one another in northwestern Europe and eastern North America, has been a primary factor in giving to the Nordic peoples that have developed them a dominance that they could not have achieved except for this favorable fortuity. The innate energy and intelligence of these Nordic peoples, the favorable physical conditions of their homelands facing upon the North Atlantic Basin, and their historic background are other facts that must not escape due consideration in seeking "causes," but coal and iron are certainly the foundation materials upon which the modern structure of industry has been built. Without adequate supplies of iron and coal—and recent investigations reveal a serious deficiency of reserves—the teeming millions of the Orient with all their surplus of labor, all their production of raw materials, cannot hope to compete with the Occident in industry and commerce, or make of the Pacific such a vast theatre of human activity as the Atlantic has become.

The title of the first book, *Coal and Civilization*, is somewhat a misnomer, for it deals about 90 per cent with coal and about 10 per cent with civilization. For all that, it forms an integral, important part in the series, a sort of authorized—and authentic—gateway into the field in which the other five books yield so rich a harvest. Dr. Jeffrey is professor of plant morphology at Harvard University. He has for many years studied exhaustively the structure and mode of origin of this truly invaluable material. It would probably be safe to say that he knows more about these subjects than any other man living.

But that he realizes to the full the human significance of his subject let his own words, quoted from the introduction to this book, prove: "The welfare and prosperity of nations, in this industrial future of great nations and races is likewise inevitably bound up with the same mineral. The problems of Europe are very obviously problems of coal. The so-called decadence of certain of the European races is clearly not due to any real degeneracy, but rather to poverty of resources in coal. This is notably true of the Latin races and is only less obviously the case for those Nordic nations which are without the indispensable mineral of our modern civilization; on the other hand the rise of Great Britain and Germany, in the past two centuries, is clearly and mainly bound up with the development of their coal resources." Who would not like to read a book by an author with such breadth of vision?

Upon this very solid foundation which Dr. Jeffrey lays in *Coal and Civilization*, let us now build up the review of *The Case of Bituminous Coal*, one of the very excellent treatises prepared under the auspices of the Institute of Economics, dealing with the problems attendant upon the coal industry.

The book is the second in the Institute's series that deals with the subject of coal. A very brief

quotation on one of the first pages, from W. S. Gilbert, "Here's a pretty mess," expresses most eloquently the situation in the coal mining industry, both of anthracite and bituminous coal, an ill situation that should be remedied, and most assuredly will be remedied in due time, either by gentle treatment gradually, or by drastic economic or political operation perhaps unexpectedly and suddenly—the doctors disagree!

This scientific study by a group of well-informed, unbiased research workers, delving deep for the truth, assuredly points in no uncertain direction the way the soft coal industry must go if it would prosper:—order must come from chaos; corporate greed must give way to common good; intelligent coöperation must supplant cut-throat competition. The industry must soon learn to regulate itself, or it may be drastically regulated by unsympathetic "others"—a trite admonition, but like so many other trite things, unevasively true.

The book is most interesting reading, written in a charming literary style of a most suddenly commercial subject. To say that it is delightful is according it only merited praise; it deserves all the attention it will assuredly receive; it should be heralded far and wide.

And this leads to the most ponderous tome in the group, both in form and matter, *What the Coal Commission Found*, which for interest, and ease of reading, is excelled only by the Congressional Record and the Reports of the Census!

None the less, the book is crammed full of basic facts, the material of which many another less comprehensive and less valuable volume will be made, the foundation of further researches that may help to bring the much-sought-after order out of the much-written-about chaos in the coal industry. The student of economics, of commerce, of business, can dig out a rich store of valuable information from this deep mine,—but he will have to do it by a deep shaft and the long-wall system!

What the Coal Commission Found cannot be recommended for light and easy reading by the tired business man when he retires to the calm and comfort of his study after dinner; nor for summer vacation leisure hours in the fragrant pine woods or along the surging sea; but it is recommended as a most valuable reference book for thoughtful students who seek facts, who desire truth and "wisdom above all things else."

Not quite so ponderous, not nearly so difficult to read, but almost as closely packed with fact, and certainly more replete with interest, is *Iron and Steel in the Industrial Revolution*. Though it deals almost exclusively with the English iron industry, it has a pertinent interest to American business men, for American industry bids fair to outstrip the development of its insular rival along the Pennines. More than twice as much American coal was produced in 1920 as British coal, a rather significant criterion

of comparison; more coal was produced in the United States in 1920 than in England and Germany combined—and the iron industry must have much coal!

With our growing interest in things industrial, we are awakening to the need of being more fully and widely informed on the history, the economics, the politics of industrial phenomena over the whole world. Our country has shed its provincialism, doffed its isolation, and stands stripped for the race of commercial and industrial supremacy. It is such books as this *Iron and Steel in the Industrial Revolution* that fit us for the race and give us strength and assurance.

The book begins with a chapter on "The Charcoal Industry in England" reverting to 1408 as the first date definitely stated, "when Bishop Langley began to produce and work iron at his own forge in Weardale. The works consisted of a 'bloomhearth' where the ore was reduced by repeated heatings and of a 'strynghearth,' at which it was further fired or forged. Nearly two tons of metal were produced each week. . . ." From this modest beginning at the close of the Dark Ages, the romance of steel runs apace to the arrogant industrialism of the modern period, when, as expressed in one of the sentences of the last paragraph of the book, "Like the thirsty lands of the Punjab, English industry today receives its vitalising supplies from five great rivers; and if the courses of these are followed it appears that two, at least, have received tributary aid from streams springing out of ferruginous soil," a symbolic expression of the significance of geographic factors.

The Ruhr-Lorraine Industrial Problem shifts the scene to continental Europe where the control of the Ruhr-Lorraine industrial resources—coal, and iron, and capital—became the key to the dungeon keep of Mars and turning the lock, let loose upon the world the villainous dogs of war.

This book takes up the post-war problems—many of prewar origin—presented by the changes consequent upon the Versailles peace. It is a clear, forceful, interesting presentation of the problems, of the efforts being made to solve them, and of the conditions affecting the whole world that arise out of the problem. It is a book for the teacher, the student, the layman, everyone who pretends to think and speak intelligently of the problems of our own time.

The author states that, "to an extent that is too little realized the problem (the Ruhr-Lorraine problem) is an international one, of world-wide scope. Superficially only France and Germany are concerned, but in reality the industrial organization based on the great deposits of coal and iron of the Ruhr and of Lorraine constitutes the industrial heart of Europe. Upon the regular functioning of this great agglomeration of industries depends in a large measure the prosperity, not only of Europe, but of all the countries in the world that trade with Europe. The Ruhr-

Lorraine problem is not only more than a French or a German problem. In the broadest meaning of the term it is a world problem."

The book is made up of three parts. "Part I is designed to set forth the basic economic facts and tendencies of the coal and iron industries in Western Europe, as they existed before the war and as they still exist, in spite of the political changes of the Peace Settlement. Part II is devoted to an analysis of the situation arising out of the war and the peace settlement, both with respect to the productive organization in the Ruhr-Lorraine region and in relation to the wider economic organization of which the Ruhr-Lorraine system has been in the past an integral part; it deals with the distribution of fuel in Europe during the years immediately following the end of the war. Part III attempts to envisage the future possibilities of the Ruhr-Lorraine system in the light of the basic economic facts set forth in Part I and of the new situation following the war. The problem is analyzed from three separate and distinct points of view, namely the French national, the German national, and the essentially economic point of view, which is international. Finally, an examination is made of the three alternative methods that may be employed in seeking a solution: (1) an attempt on the part of France and Germany to maintain in relation to each other the maximum degree of independence; (2) a resort to political pressure by either or both countries; and (3) the fullest possible Franco-German coöperation."

Such is the fifth book in the group, a volume well worth serious study.

And the final book in the group, *The French Debt Problem*, technically is a book for the economist rather than the geographer; but it is so fluently written, the difficult matter of which it treats is so lucidly presented, that the layman finds it easy and pleasant and valuable to read. Twelve chapters comprise the book: I, Introduction; II, International Income; III, Growth of the Public Debt, 1814-1918; IV, Post-War Budget Deficits; V, Post-War Growth of the Public Debt; VI, The Exchange and Currency Situation; VII, Production and Trade; VIII, The Economic Dilemma; IX, There is a way out; X, The French Point of View; XI, The Foreign Debt Problem; XII, What of the Future? Several valuable appendices, largely statistical, close the book.

The facile style in which the book is written, the pertinent subject matter so significant in the present relations between France and America, and fairness of the treatment, combine to make a most pleasant bit of reading from material which in the hands of a less skilled and competent author might be dry and impossible.

All the six books treated in this group of reviews are authoritative and of contemporary interest. All are printed well and bound well. They are necessary in every man's working library.

W. ELMER EKBLAW.

THE AGRICULTURE YEAR BOOK FOR 1924
United States Department of Agriculture

The Agriculture Year Book for 1924 is the fourth of those published under the direction of the late Henry C. Wallace, Secretary of Agriculture, who planned that the year books, during his term of office, should consider in detail the economic phases of agricultural production and marketing.

It is interesting to compare the year book of 1924, with its five detailed articles on the economic phases of basic agricultural problems, and the year books of 1899 and 1900, which contain twenty-three and thirty articles, respectively, on topics more specialized and less applicable to the average farmer, such as "Agricultural Libraries," "Rabies," "Agricultural Education in France," and "The Date Palm and Its Culture."

The secretary's annual report in the *Year Book* has become increasingly valuable, as it has become increasingly economic in character and helpful in outlining the agricultural situation and offering suggestions for improvement.

On the whole, American agriculture is in the best position it has held since 1920, although improvement has not been evenly distributed. From the regional viewpoint, we note that the Pacific States have suffered decrease in the wheat crop, owing to excessive drought. California suffered loss also from the ravages of the hoof-and-mouth disease. The Great Plains States—North Dakota, South Dakota, Nebraska and Kansas—as well as Minnesota, show considerable increase in wheat, which sold at a fair price, because the Canadian crop was small. The Southern States showed a fairly uniformly distributed cotton crop. Georgia, Mississippi, Arkansas, and Oklahoma have had good crops where the yield had been poor in 1923. The South Atlantic States suffered from unfavorable weather and the boll weevil. The corn crop of the Corn Belt was curtailed by weather conditions, but hog production there was heavy. Through the development of new territory in the West, especially in Colorado, Idaho, and California, vegetable acreage greatly increased, especially in lettuce.

The Department of Agriculture has fostered the hunt for and introduction of new plants. Barley and wheat from Abyssinia and the Kashmir section of British India have been brought in for high altitudes and dry farming, as in the western states. Drought-resistant varieties of corn from the Andes are being developed for the southwestern states. Barleys from Algeria, Tunis, Egypt, and India were sown at Sacaton, Arizona, of which many gave high yields. Molasses grass from the tropics was introduced on the sandy soils of Florida, and grew very well.

The several foreign service branches of the Department of Agriculture are investigating varieties of potatoes in Canada, plant diseases in Europe, rubber production in the tropics, forage grasses in Cuba, plant geography in Europe, cereal rust in India, and many other problems of

international agriculture. The economic operations of agriculture in Europe are studied under an assistant chief of the Bureau of Agricultural Economics, stationed at Berlin.

The entire period of the farmers' depression is sketched in this report, as is also the work done by the Department of Agriculture to alleviate the situation, such as dissemination of "intention to plant" information, collected from the farmers and published for their use; the expansion of the warehouse system, the market news system; the grain, fruit, and other inspection services; foreign seed reports, cooperative marketing, and broadcasting of crop, market, and weather reports by radio. In this last service, there are 112 broadcasting stations, found in all states except Nevada, Wyoming, Mississippi, West Virginia, Delaware, New Hampshire, Vermont, and Maine.

A review of each of the *Year Book* articles follows:

HIGHWAYS AND HIGHWAY TRANSPORTATION

T. Warren Allen, A. B. Fletcher, A. T. Goldbeck, E. W. James, J. Gordon McKay, H. R. Trumbower, and H. S. Fairbank, Bureau of Public Roads.

With the advent of gasoline vehicles, highways have become one of the major links between geographic divisions of the country, hence this article is a timely one for geographers. Considering that there are 2,941,294 miles of roads in the United States, including interstate, state, county, and local roads, and that if a zone ten miles wide were marked off on each side of them, this zone would include the homes of 90% of the population of the United States, it can be seen that highways are a factor of national geographic and economic importance.

The 1921 survey of public roads showed a total surfaced road mileage of 387,760 miles. The mileage of the various types of road, with the approximate per cent of each, are as follows: 63,339 miles (16%) of sand clay; 199,899 miles (51%) of gravel, chert, or shale; 58,036 miles (15%) of water bound macadam; 19,309 (5%) of surface treated macadam; 10,264 miles (2.6%) of bituminous macadam; 1,601 miles (0.5%) of sheet asphalt, 4,978 (1.2%) miles of bituminous concrete; 15,611 miles (4%) of Portland cement concrete; 3,333 miles (0.8%) of brick, 27 miles of wood block, 60 miles of stone block, and 11,303 miles (3%) of miscellaneous; the balance being unsurfaced earth roads, either totally unimproved, or graded and drained.

Considering surfaced roads only, the West Central States have the greatest mileage, 759,820 miles; the South Central States being next with 416,617 miles, while New England has the smallest mileage, 83,295. In all state groups, by far the largest per cent of roads are the gravel, chert, and shale roads, except in the South Atlantic States, where sand-clay roads are three times as numerous as the gravel.

The economist will be especially interested in

the pages dealing with the costs of various roads, and the sources of revenue therefor. It is calculated that the average expenditure per person is one cent for every 200 miles of surfaced road. Toward this expenditure the citizen of the Pacific coast pays seven times that which the citizen of the West North Central States pays, and one third more than the New Englander, whose tax is the next highest.

The various kinds of roads, and their virtues, are described in detail, with numerous photographs, and the relation between the conditions of roads and tonnage transportation over them is also treated, with graphs.

FARM CREDIT, FARM INSURANCE, AND FARM TAXATION

Nils A. Olsen, C. O. Brannen, G. F. Cadisch, and R. W. Newton, Bur. of Agri. Econ.

The financial standing of the farmer becomes of interest to geographers when the data on mortgages, loans, etc., is collected and presented so as to compare the financial status of the farm owner in various regions of the United States. This presentation has been graphically accomplished in this article.

Agriculture is a heavily capitalized industry. Considering as capital all farm property—lands, buildings, machinery, and live stock—the capital employed in 1920 amounted to \$78,000,000,000. Interest due in 1920 on farm mortgage debts alone is estimated at \$500,000,000.

Very interesting maps accompany this article. One sees that in 1920 37.2% of all owner-operated farms were mortgaged. The more newly settled the region, the greater the per cent of mortgaged farms. North Dakota led with 71.1%. The North Central States, with California and Oklahoma, averaged 50–60%. In fact 61% of the total mortgage debt in the United States was on farm property in the North Central States. The states most free from mortgages were the three contiguous states, Virginia, West Virginia, and North Carolina, with 17.8%, 14.2%, and 16.2%, respectively.

Where mortgage debts are so high, bank and association loans must be high. The average loan is \$3,065; the largest state average is that of Iowa which is \$7,509, and the smallest, \$1,706, is found in Arkansas.

This article presents a study of the Federal Loan Act of 1916, the Federal Loan Banks, terms of loans, emergency credit, insurance on farms and live stock, life and hail insurance, and farm taxation.

HAY

C. V. Piper, R. A. Oakley, H. N. Vinall, A. J. Pieters, and W. T. Morse, Bur. Plant Ind.; W. J. Spillman, O. C. Stine, J. S. Cotton, G. A. Collier, M. R. Cooper, and E. C. Parker, Bur. of Agri. Econ.; E. W. Sheets, and A. T. Semple, Bur. Animal Industry.

One might use the term "history and geography

of hay" in reviewing this article, for the first half of the article deals with the history of the development of the hay industry from pre-Revolutionary times to the present time. Geographers will be interested in the expansion of the hay areas during this development of the industry.

A series of maps shows the slow but steady westward movement of the hay crops, from 1839 to 1919, by decades. In 1839 New York was the leading state in hay production, but by 1889, the introduction of haying and other machinery on the prairie lands gave Iowa the lead. By 1919 the hay crop was more generally spread over the United States, and again New York led in the production. Our annual production of hay is now about 98,000,000 tons.

Various kinds of grasses used for hay are described in this article, as well as specifications for grading and inspection, and data on cost of production, while the processes of hay making, old and new, are given in detail.

THE POULTRY INDUSTRY

M. A. Jull, A. R. Lee, and H. Bunyea, Bur. of Animal Industry; R. R. Slocum, D. Jackson, and S. W. Mendum, Bur. of Agri. Econ.; C. F. Langworthy, Bur. of Home Econ., and W. L. McAtee, Bur. Biol. Survey.

This article contains sufficient maps to satisfy all of a geographer's possible questions in regard to the poultry industry in the United States. A group of maps shows the increase in poultry by counties from 1880 to 1920. From 1880 on, the center of poultry population is clearly the Corn Belt.

The greatest number of poultry per farm centers about Iowa, with 133, and Kansas with 105. The average is not much above 40 in the Western States, except in California where it is 92. The number increases gradually toward the east, where New Jersey and Delaware have an average of 90 and 99, respectively.

Iowa leads again in the number of eggs, having an output of 120,697,319 dozen annually (1919 census). It is interesting to note that Maine, whose total number of poultry and number per farm are both very low, nevertheless produces the greatest number of eggs annually per hen, which is 85, as against the lowest rate of 38, in Georgia.

The article furnishes detailed information on the kinds of poultry in the United States, price of products, feeding problems, marketing of eggs, and cold storage.

WEATHER AND AGRICULTURE

A. J. Henry, J. B. Kincer, H. C. Frankenfield, W. R. Gregg, Weather Bur., B. B. Smith, Bur. of Agri. Econ., and E. N. Munns, Forest Service.

Of interest to any student of geography is this article which gives what one might well call a "bird's-eye view" of the weather. In reality it is a bird's eye view, for one pictures himself as looking down on the earth from a great height

and seeing the cyclones, trade winds, monsoons, etc., as they follow their appointed paths.

Climate, we are told, is the main factor in determining the settlement of various regions of the earth, and this article, which describes in detail the basic causes of weather, the resultant climate, crops, peoples, and industries, will hold the attention of students of meteorology, agriculture, population, commerce, etc., as well as that of the geographer.

The writers divide the earth into areas on the basis of rainfall and of temperature. The first classification shows us that there are but four extensive areas that have sufficient rainfall to support a large population. These are southeastern and extreme eastern Asia, Europe, southeastern North America, and southeastern South America. The great agricultural sections of the earth are outside the tropics, in moderately humid portions of the northern hemisphere. In this hemisphere only 10% of the land area has as much as 20 inches of rain annually.

The second classification gives us five zones, or belts, as follows: (1) The tropical belt, where the average temperature of all months is above 68° F. Here we have heavy rainfall and frequently unhealthful conditions, though there are some desert places, as the west-central coast of South America, central Australia, and in north-central and eastern Africa. The vegetation includes megatherms, such as breadfruit, sago, coffee, sugar, etc. (2) The subtropical, home of the xerophytes, plants which like dryness and high temperature. Here the trade winds dominate, and rainfall varies greatly. This zone includes the savannas in Africa and South America, on both sides of the equator, also the Sudan in Africa, the llanos of Venezuela, the campos of Brazil, and the Australian downs. (3) The temperate zone, where the coldest month averages below 64° F. and the warmest over 72° F. This is bounded in general by latitudes 40° S. and 22°-45° N. The crops are wheat, corn, cotton, figs, grapes, etc. (4) The cold zone, home of the microtherms, where the warmest month averages 50°-72° F., and the coldest below 43° F. Evergreens, hardy deciduous forests, small grains, and some fruit and corn are raised here. This zone includes the Asiatic Plateau, southern Siberia, most of Russia and western Europe, southeastern and south-central South America, and much of North America. (5) The polar regions, home of the hekistotherms, such as lichens that grow where the average temperature of the warmest month is below 50° F.

After this general world division, the United States is treated in detail as regards weather and crops. Many maps are given, showing rainfall, sunlight, periods of plant rest, etc. In regard to the last, it is interesting to note that the rest period of plants, as opposed to the vegetative period, occurs usually in months where the mean monthly temperature is below 49° F. This is seven months (October to April)

in the Northeastern States, six months in Kansas and Nebraska and east to the Middle Atlantic States, and south to the northern part of North Carolina, Tennessee, Arkansas, and Oklahoma. In the eastern part of the Gulf States, only January has an average below 49°, so that there is but one rest month there, while Florida has none.

The authors give us another cross section of the states, so to say, by their crop classification, by which they divide the eastern United States into five regions, as follows: (1) the subtropical coast, (2) the cotton belt, (3) the corn and winter wheat belt, (4) the spring wheat belt, (5) the hay and pasture province. These areas are described in detail, with their boundaries in the form of temperatures, and their crops, making each a well defined unit.

The practical as well as the theoretical farmer will find to his interest a full discussion of the dates of earliest and latest killing-frosts, in various parts of the country, as well as the chances for having an early or late disastrous frost in any year. Included also are six pages given over to sunshine averages, the areas of maximum and minimum sunshine, and the average hours of sunshine that one may expect at any given place.

The forester, too, will find it worth his while to read the section on the growing forest, reforestation, and the foes of forests in relation to the weather.

With reference to grazing, the United States is divided into four range areas, with description of the native vegetation of each, and the carrying capacity of the pasture. There are four such areas, (1) the western, which, in turn, is subdivided into (a) the farm grazing belt, and (b) the grazing forage belt; (2) the Cotton Belt; (3) the Appalachian belt; and (4) the Great Lakes region.

This notable article covers many phases of agriculture that are affected by the weather, and in doing so, brings together various interesting data to afford us a clear cut climatic picture of the United States.

AGRICULTURAL STATISTICS

Geography has the reputation of being a purely descriptive science, but in order to hold its place today among other sciences, it must tend more and more to become an exact science. For this reason it is hoped that no economic geographer will fail to acquaint himself with the 680 pages of statistics which form the second half of the *Agriculture Year Book*.

These statistics are largely estimates made by the Division of Crop and Live-stock estimates and of Historical and Statistical Research. They are based, from 1919 to date, upon acreage changes from year to year as shown by a sample of approximately 2% of the crop acreages in each year, supplemented by state enumerations.

These statistics cover a wide range, including grains, fruits and vegetables, other crops, farm animals and their products, forestry and forest

products, exports and imports of agricultural products, and miscellaneous. Notes on agricultural production in foreign countries are given, and statistics of international trade.

ALICE CREW BAKER.

ALLEN, NELLIE B. *Africa, Australia, and the Islands of the Pacific*. xii and 448 pp.; well illustrated. Ginn and Company, Boston, 1924. 5½ x 7½ in. \$1.00.

This volume is one of the series of "Geographical and Industrial Studies" written by Miss Allen covering the geography of the world. The book is prepared for school use in the intermediate and upper grades, but it is of exceeding value to the adult reader who would gain accurate and vivid mental pictures of these distant regions by means of a few hours of interesting reading. Africa is approached as the "colony continent," and the treatment gives point to the name. Australia is treated as the "island continent." The eleven colored maps and 181 illustrations in the text enable the reader to develop accurate notions of place relations and concrete mental concepts of the landscape and the people of the regions as treated in the descriptive text.

At the close of each chapter are found "Suggestions for Study" which furnish abundant material for individual investigation and for the solving of problems suitable to pupils studying geography. The appendix includes the statistical matter needed for a study of the regions treated in the book. While the book is presented as a supplementary reader in geography, its use as a textbook for a study of the regions included would be appropriate.

DOUGLAS C. RIDGLEY.

WARD, ROBERT DECOURCY. *The Climates of the United States*. xv and 518 pp.; maps, diagrams. Ginn and Company, Boston, 1925. 8½ x 5½ inches. \$4.00.

Few books in any science may be considered landmarks by which students, teachers, and investigators may orient themselves for their whole field of study and research, but *The Climates of the United States* is one such book. For every student of climatology in the United States it becomes a companion necessity to J. Hann's *Handbuch der Klimatologie* and Kendrew's *Climates of the Continents*, and with those great works comprises a trio almost sufficient for any library. For every United States geographer it is indispensable, just as Ellen Churchill Semple's *Influence of Geographic Environment* and Baker and Finch's *Geography of the World's Agriculture* have been since they appeared, and like them it is a landmark in the field.

The science of climatology in the United States is distinguished by three famous names: A. W. Greely, veteran and pioneer; A. J. Henry, indefatigable seeker after truth; and R. DeC. Ward, scholar and scrupulous research man *par excellence*; a trio of which any nation, any science may, justly be proud. They have laid the foundation

upon which a score or more of younger men are building patiently and well, sure that they need not distrust their underpinning.

It is quite safe to say that meteorology and climatology as developed in the United States have nothing to fear by comparison with the progress of any other science, or with the same science in any other land. The United States Weather Bureau is one of the best in the world, and it is upon the mass of data assembled through its great organization and its thorough system that the science is so well established. The men in the Weather Bureau, and the detached students and observers throughout the country are relatively as numerous, as well trained, and as conscientious as any in the world. Their contributions to science, to scientific literature, and to public welfare and progress are extensive and inestimably valuable. That they coöperate closely and effectively, such a book as Professor Ward's conclusively shows; that their joint labors and researches here fit our people and our industries goes almost without saying.

But to return to *The Climates of the United States*. The twenty-three chapters constitute a summary adequate for a thorough understanding of the several subjects with which they are concerned. To indicate the scope of the book it is worth while listing these chapters:

- I. Historical Development of Climatological Work in the United States.
- II. The Major Climatic Controls.
- III. Climatic Provinces of the United States.
- IV. The Weather Element in United States Climates.
- V. Temperature.
- VI. Frost.
- VII. Prevailing Winds and their Characteristics.
- VIII. Mean Annual Rainfall.
- IX. Rainfall Types and Monthly and Seasonal Rainfall.
- X. Some Characteristics of Rainfall.
- XI. Snowfall.
- XII. Humidity, Evaporation, and Sensible Temperatures.
- XIII. Sunshine, Cloudiness, and Fog.
- XIV. Thunderstorms.
- XV. Tornadoes.
- XVI. Cold Waves, Northerns, and Blizzards.
- XVII. Hot Waves and the Indian Summer.
- XVIII. Hot Winds and Chinook Winds.
- XIX. Land and Sea Breezes and Mountain and Valley Winds.
- XX. The Essential Characteristics of United States Climates.
- XXI. Climate and Health.
- XXII. Climate and Crops.
- XXIII. The Climates of Alaska.

A distinct advantage to the average student, teacher, and layman is the fact that the long, involved tables of observational data and statistics upon which the conclusions are based are not included within the covers of the book. The

professional climatologist and the research worker seek them in the source material which the Weather Bureau collects, tabulates, and publishes; the student, teacher, and layman are well content to trust to the soundness of judgment, the integrity of calculation, and authority of presentation of the author. To publish all the data upon which the book is based is obviously impossible; the author was wise in omitting them all.

Two chapters of the book are inclusively devoted to the relationship of climate to health and to crops. Every reader appreciates these two chapters and realizes their value; but would it not have been as well to have included these within another volume which should treat of the relationship of climate to physiography, to soil, to plant and animal life, and to man's existence, activities and industry? Health and crops are important indeed, perhaps most important; but other relationships of climate are also significant, both directly and indirectly.

Even to ask this question is perhaps presumptuous, for the book is so excellent, so interesting, so satisfactory from every viewpoint, that it seems a mistake almost to intimate any fault in it, if fault there be. And Professor Ward, in his preface, is characteristically so courteous, so fair, so modest, and above all so generous in his acknowledgment of help from others, that he disarms all criticism.

The Climates of the United States is a fine piece of work that will stand the test of time. A "Physiography of the United States" as a companion source of geographic foundations, is needed. Who will produce it, and make it as inclusive, as thorough, as satisfactory as this work of Professor Ward's on climate?

W. ELMER EKBLAW.

CARVER, THOMAS NIXON. *The Present Economic Revolution in the United States*. Little, Brown and Company, 1925.

The Present Economic Revolution in the United States by Thomas Nixon Carver is a book likely to command the attention of thoughtful readers who are interested in a broad view of the trend of modern economic life. It is a study of the rising financial power of labor, with some discussion of its causes and some speculation as to its effects. The purpose of the book as set forth in the introductory chapter is twofold: first, "to convince reasonable minds that it is not only possible to have a wide diffusion of prosperity among all classes, but that we are actually beginning to realize that possibility here and now"; second, "to show that the conditions that make labor a commodity tend toward a higher state of civilization than the conditions that make it a dependency."

In support of the first proposition, Professor Carver brings forward three kinds of evidence. First, he shows that, after all corrections for the increase in population and the decline in the purchasing power of the dollar have been made, savings deposits, the assets of building and loan asso-

ciations, and insurance premiums are increasing. If this is true, it follows that stocks and bonds purchased by laboring people represent additional saving, not merely a transfer of funds. One index to the importance of this second evidence of financial power is the amount paid in dividends to people of small income. In 1917, \$190,000,000 in dividends were paid to people in the \$1,000 to \$5,000 income class. This was 9.5 per cent of the total dividends for that year. In 1921, this same class received in dividends \$562,000,000, which was 22.7 per cent of the total dividend for that year. Another index is the large volume of securities which corporations report as having been sold to employees. In the third place there are the labor banks. The number of such institutions has increased rapidly since their beginning in 1920. In November, 1924, thirty-three such banks were in operation, and plans for many more were under way. Altogether, there seems little reason to doubt that our labor group is increasing in financial power.

The second purpose of the book involves a defense of the capitalistic system. Under this system the services of laborers are sold as are commodities; they have a market price as do commodities; and this price is reached through a process of bargaining as is the price of any other commodity. As long as capital increases more rapidly than population, the bargaining power of labor increases; wages rise; the savings of laborers increase; and wealth is diffused. Any increase in capital is advantageous to labor; but the increase of capital through the savings of laborers themselves is especially conducive to their prosperity. That laborers can and do avail themselves of this increased bargaining power, is due to the fact that under the capitalistic system labor is an independent, not a dependent, factor in production.

Professor Carver is careful to point out that capitalism is a system in process of development: that the ideal of the system is "equality under liberty"; and that this new financial power of labor is an evidence that the ideal is not impossible of realization. It should be kept in mind that by equality he means equality among occupations, not among individuals, and that he admits that "within a given occupation there may be great differences of prosperity, owing to differences in industry, personal skill, intelligence or training."

Two criticisms have been brought against Professor Carver's argument. It has been said that, after all, labor is only buying a minority interest in industry, and that, since it has no share in control, its investment is of questionable value. It has been stated also that this new prosperity of labor merely means that a few laborers have moved into the class of small capitalists and that the great mass of laborers are as badly off as they have always been. There is validity in the first criticism. The control of industry is a matter too important to be passed over lightly in a discussion of the position of labor in industry.

It is to be regretted that Professor Carver gave it so little attention. There is reason to think that a careful consideration of the problem would have strengthened rather than weakened his argument. The second criticism is beside the point. Professor Carver has not claimed prosperity for all labor as an accomplished fact; he has claimed that the trend is in that direction and that the outlook is hopeful.

PEMBROKE H. BROWN.

WHITBECK, R. H. *Economic Geography of South America*. vii and 430 pp.; maps, diagrs., ill., bibliography, statistical tables, and index. McGraw-Hill Book Company, New York, 1926. 6 x 9 in. \$3.50.

Economic Geography of South America, the first textbook of college grade on the geography of South America to appear in the United States, comes out at an opportune time. Mining companies, manufacturing interests, and commercial concerns are depending more and more upon South America for raw industrial materials and foodstuffs. The men engaged in these enterprises are entering the southern continent in ever increasing numbers, taking with them billions of dollars of capital. Universities, colleges and normal schools are offering new courses in the geography of South America. Men engaged in all these lines, demanding information on the country, people and industries of the regions in which they are interested, can find in Whitbeck's *Economic Geography of South America* a clear portrayal of the physical environments, a vivid description of the peoples, and an analysis of the industries of the several countries and their geographic regions. This volume is an outgrowth of the writer's course in the Geography of South America given at the University of Wisconsin, and of the impressions gained on a trip in 1924 to parts of Peru, Bolivia, Chile, Argentina, Uruguay, and Brazil.

The book is divided into eighteen chapters, each of which deals with a republic or a part of a republic, except the opening chapter on "The Continent of South America" and the closing chapter on "South America as a Whole and Its Relation to the United States."

In the initial chapter Professor Whitbeck presents the more important facts of the physical environment, the location, the relief—the Andes Mountains, the Brazilian and Guiana Highlands, and the Great River Basins—the coast line, and the climates, and the influence of these upon the settlement and development of various parts of the continent. His interpretation of the influence of rainy tropical climates upon the health, vigor, and social status of the people and the relation of these to the economic development of the tropics is illuminating. However, it is to be regretted that, after the author had developed so admirably the small part played by the tropical lowlands of the continent, he introduced in his

"Summary of Climatic Conditions in South America," on page 28, conflicting statements in points 6 and 8. If the "highlands of southeastern Brazil, the plains of the River Plate and the Valley of Chile must be the chief regions of power and progress in South America," it follows necessarily that they must produce as large a part of South America's economic products as they do now. If this be true, how can the tropical lowlands "supply an increasing part of South America's economic products?" As a matter of fact the hot, moist tropical lowlands of the continent are now producing a smaller proportion of the export commodities of the continent than they were ten years ago.

While the author does not treat in detail the characteristics of the types of climate, he has introduced the basic elements for a detailed study. With figures 1, 5, 7 and 8 the student can work out the various types of climates in different parts of the continent. From the standpoint of the student and the teacher this probably is better than a discussion by the author. This method makes it possible for the teacher to develop a series of problems to be solved by the student.

The material on the several countries is divided for the most part into four sections: (1) the historical background and striking features of the country briefly, (2) the major geographic divisions of the republics, (3) the industries transportation, mining, manufacturing for the country as a whole, and (4) foreign commerce. This organization makes it possible for the author (1) to present in excellent form the knowledge desired by the student, the commercial man and the government official on South American countries, the people, resources, industries, and commerce of each country as a whole, for these are the units with which international affairs deal, and (2) to recognize within a country or overlapping national boundaries the major geographic regions which possess physical unity and consequent economic unity. The discussions on the foreign commerce of each country are short but vital to an understanding of the economic fabric of each republic and of the continent as a whole.

The book is well illustrated. It contains almost two hundred maps, diagrams, pictures and graphs, the most of which are simple and easily interpreted and emphasize in a striking manner the facts for which they were chosen. The salient lists of references embodied afford the student an opportunity to investigate more thoroughly special topics in which he may be interested.

The volume on the whole is a credit to the author and to the publishing company. It should be in the hands of every student and teacher of geography and every man interested in South America commercially and politically, for it gives the geographic background which will enable one to understand the economic developments and the political activities of the several republics.

CLARENCE F. JONES.

CUNNINGHAM, BRYSSON. *Cargo Handling at Ports*. x and 180 pp.; ill., diagrams, appendices, and index. John Wiley and Sons, New York, 1925. 6 x 9 in. \$3.50.

CUNNINGHAM, BRYSSON. *Port Administration and Operation*. 169 pp.; pictures, diagrams, appendices, and index. John Wiley and Sons, New York, 1925. 6 x 9 in. \$4.00.

Cargo Handling at Ports is a survey of the various systems in vogue with a consideration of their respective merits from a broad viewpoint and its companion volume *Port Administration and Operation* is a review of the systems used in various countries.

Cargo handling has been modified considerably during recent years by the introduction of mechanical and automatic appliances for handling goods. The enhanced cost of labor, the pressing necessity for effecting every possible economy, and the economic importance of expedition have forced the matter in a striking way upon the attention of port authorities, ship owners, and stevedores. From this viewpoint the first volume defines and coördinates the principles underlying cargo-handling at different ports throughout the world.

The discussion is built around cargoes and cargo-handling facilities rather than upon individual ports. After a brief but excellent discussion of the varieties and characteristics of the three large groups of cargo—bulk, general, and special—the author portrays in a clear manner (1) the cargo-handling equipment of passenger liners, intermediate vessels, and cargo vessels, (2) the quayside cargo facilities—transit sheds, railway sidings, road access, cranes, hoists, winches, lighters, conveyors, and elevators—and the various processes of cargo handling at the quayside, lightering and trucking, and (3) the receipt and delivery of cargoes of coal, ore, grain, refrigerated produce, fuel oil, and whole timber. Almost one fourth of the volume is devoted to a discussion of the items in the last section.

The second volume deals with (1) the various functions of ports, (2) the classification of ports as regards geographic position, trade, function and auxiliary services, (3) the governments of ports under the control of state, autonomous interests, railways, municipalities and private concerns, (4) the duties of the members of port organizations, (5) rates, rents, and warehouse receipts, and (6) port belt lines, labor, police force, and by-laws. Since methods of administration, port government, and other port factors, vary markedly throughout the world, it is rather difficult to deduce from the interminable ramifications of multitudinous systems some workable scheme of general coördination. There may be a slight measure of agreement in regard to certain groups of ports with allied interests and traditions, but in general dissimilarity prevails.

All systems of port government attempt to meet local needs and requirements and therefore embody certain features closely related to special

geographic conditions, to politics, or history, and to racial, social and business relations. Thus each port or group of ports, to be effective in moving freight for which they are designed must have the political machinery which will facilitate the flow of commodities. Variation in port administration and operation are almost as wide as those in the commodities that enter the world's marts. Yet in the face of all these difficulties the author has brought out, as only the master of his field can do, the facts and principles which should guide port governments and port administrators.

The author has limited his investigations to the leading ports of Great Britain and her dependencies, to those of the other chief maritime nations of Europe, and to those of the United States. A few illustrations have been drawn from outside these limits, but only in exceptional cases. He has devoted the greater part of his attention to British port administration. These limitations reduce somewhat the serviceability of the book. No reference is made to the important ports of South America, yet South America is important in international trade and some of her ports have features worthy of consideration. However, it should be stated that the field is so vast and conditions so variable that to include the facts of all important ports of the world would result in a volume so large as to defeat the purpose for which it was designed.

The five appendices in each of the volumes add more valuable material to the wealth of information embodied in the text and the excellent indices of the two books make readily available all the information presented. The organization and treatment of the subject, and the character and workmanship of the books reflect credit upon the author and upon the publishing company.

CLARENCE F. JONES.

BURNS, C. DELISLE. *Industry and Civilization*, 272 pp. The MacMillan Company, New York, 1925. 8½ x 5½ in. \$3.50.

FARNHAM, DWIGHT T.; HALL, JAMES A.; KING, R. W.; HOWE, H. E. *Profitable Science in Industry*. x and 290 pp.; ill. The Macmillan Company, New York, 1925. 8 x 5½ in. \$3.50.

BROOKINGS, ROBERT S. *Industrial Ownership; Its Economic and Social Significance*. 105 pp. The Macmillan Company, New York, 1925. 7¼ x 5¼ in. \$1.25.

CARVER, THOMAS NIXON. *The Economy of Human Energy*. The MacMillan Company, New York, 1924. 8¼ x 5 in. \$2.50.

These four somewhat related books, of interest and value to the economic geographer, the economist, and the sociologist, indicate the growing interest in the study and investigation of man's industries and their effect upon his social and economic organization, and upon his character and development. They represent the progress being made toward a clearer understanding of

relationships between men, and groups of men, in the new order of industrialism and commercialism.

Industry and Civilization, by C. Delisle Burns, is a philosophic analysis and criticism of the moral influences in economic relationships, of the social responses to industrial gregariousness. It is a thoughtful study of present conditions throughout the civilized world, where the revolutionary changes wrought by the rise of industry and commerce to their commanding position in the affairs of man, and their striking effects upon his way of thinking, are only beginning to be understood.

The author presents his thesis in a most methodical manner. He delimits carefully his subject matter as being the interdependence between economic science which he defines as the analysis of the relationships of men in exchange of goods and services, and ethics, which he defines as the science of good action and good character or welfare in general. He then applies psychological principles to the investigation of the social phenomena of economic processes and organization. He next considers industrial organization as a single system and analyzes the moral standards operative in industrial practice among the workers, the organizers, the owners of capital, and the consumers. He concludes that industrial morality is very largely embodied in law, and that therefore Government is a dominant moral influence of the community which endeavors to express itself, somewhat inchoately at times, in a distinct social and cultural system; the exchange of goods and services is always "moral" in some sense.

The author makes no pretense of having covered his field. He frankly states that he has merely indicated its extent, and revealed the possibilities for research and service that lie within it. He points out that the field is left open by the skilled psychologists and philosophers, who should preempt it, to the economists who know little of psychology, and to historians who know little of ethics; but in emphasizing the need of critical research, he declares that the economist and historian are not to blame if they fail to apply the right psychology and ethics, for there is as yet none to apply.

Profitable Science in Industry is written jointly by Mr. Dwight T. Farnham, a consulting engineer who has written much and authoritatively on industrial problems and who in this volume explains the general principles of scientific management in industry; by Dr. H. E. Howe, editor of *Industrial and Engineering Chemistry*, who shows what valuable guidance and assistance the chemist can render in industry; by Dr. R. W. King, of the American Telephone and Telegraph Co., who relates what electricity is doing, and is likely to do in industry; and by Prof. J. A. Hall of Brown University, who discusses the mechanical contribution to manufacture by the design and construction of the wonderful machines that make industry on a big scale possible.

Geographic and economic facts are almost inseparably, yet most logically, blended in this book, and though the latter are considerably more numerous, the former help essentially in building up the thesis that the authors present. Naturally, it is to the industrial phase of economic geography that this volume is most related, and it is to the economic geographer that it is most interesting and appealing.

The foreword to the book, by S. W. Stratton, president of Massachusetts Institute of Technology, is a clear, forceful argument for the use of the scientist in industry, an argument that includes the geographer, because in world competition the regional influence is often the critical and decisive factor in success or failure.

In the concluding chapter, Dr. Howe outlines the program of research which in his opinion should be followed. His program would make scientific research an association activity, coordinated throughout the country and throughout the whole industrial field so that there should be the minimum of duplication and confusion, and the maximum of efficiency. This plea for organized research in science should ring clear in the ears of American geographers who are at present, in large part at least, working here, there, and everywhere, without any thought or concern for a unified plan.

Industrial Ownership, by Robert S. Brookings, is a significant contribution to the literature on the economic and social consequences of the capitalistic system by one who has himself gone through the business man's vicissitudes of rapidly changing economic practices and ideals, and who, from his experiences, speaks with an intelligent appreciation of the practical as well as the theoretic side of the problem of industrial ownership.

There is not much geographic value in this little book, except as it sets forth some of the final effects, the ultimate expression, of those physical factors that have led to the origin and expansion of industrialism as a human reaction to environmental forces. It is likely to stimulate the reader to an investigation of causes and so to the study of geography.

The Economy of Human Energy, by Thomas Nixon Carver, is a most refreshing book and a most valuable contribution to the literature on the subject of conservation. It is likewise a most timely book, in that it is likely to attract attention to a "resource,"—the resource of labor or human energy,—that many conservationists are prone to ignore, and that certainly should be conserved as carefully as coal, or forests, or water power.

No one who reads this well-written book by Professor Carver will be disappointed either in its style or in its subject matter, for it is written with clarity and fluency, and packed full of interesting and enlightening facts. It piques the curiosity, it supplies a store of new ideas, it allures the reader from one page to the next with

its suggestive sequence of vital facts and vagrant fancies; all to the end that the reader, when he has laid down the book finished, shall know better than he ever did before "that in laboring for the building of a nation in which all the energy of the people is harnessed to useful work and none of it dissipated in vice, dishonesty, destructive conflict, luxury or distraction, he is in reality laboring for the building of the Kingdom of God in which many can live, and live abundantly; in which much life that is now lost or going to waste will be sought after and saved, and made to promote other life."

Here are some of the paragraph headings:

- "How prosperous does a nation deserve to be?"
- "Thrift and the standard of living."
- "Harvesting the sea; eating big fish to save the lives of little fish."
- "Three acres and subsistence."
- "Geographic origin of thrift."
- "Is civilization worth the trouble?"
- "Who are the superior men?"
- "What to do with money."
- "Bigness no crime."
- "The unbalanced sandwich."
- "Temperamental rebels."

These and a thousand others equally suggestive make excellent reading; just try the book, and be convinced!

W. ELMER EKBLAW.

BADER, LOUIS. *World Developments in the Cotton Industry, with Special Reference to the Cotton Piece Goods Industry in the United States.* xvii and 187 pp.; diagrams, tables, appendix, bibliography and index. The New York University Press, New York, 1925. 6 x 8½ in.

This book gives in a clear and concise manner the significant tendencies in the cotton piece goods industry of the world since 1909. It shows the change and direction in growth in the various countries of the world and the effects the changes on the new cotton manufacturing countries have had upon the industry in the United States and in Great Britain.

The work is divided into two parts. In the first part, "Recent Growth and Changes in the Cotton Manufacturing Industry," constitutes the central theme. The recent growth in Asiatic countries, especially Japan, has been remarkable; and, owing to the industrial trends in those countries, the growth of cotton manufacturing can be expected to continue on a large scale. Brazil now supplies ninety per cent of her domestic requirements for cotton goods, and her exports of cotton manufactures are beginning to amount to considerable quantities. In other Latin American countries the cotton industry is in the process of establishment. Yet the Latin American countries still constitute our best markets for cotton cloths. In Europe the industry has been going through an evolution from the coarser fabrics to

the finer grades of material. Also England has gone out to gather in that cheap cotton so necessary to the welfare of her industry. Through the Empire Cotton-Growing Corporation, the possibilities of cotton growing throughout the world are being studied. Furthermore, vast engineering enterprises are being carried into execution to add thousands of acres to the present cotton producing areas of the Empire.

The cotton industry in the United States has been going through an evolution too. New England mills have turned to fine goods and greater diversification; they are curtailing production, some of the mills operating at only 35 per cent capacity, while others have turned to "Rayon" silk. In contrast, the industry in the South continues to grow for very good reasons. There the mills produce chiefly the coarser fabrics and thus find ready foreign markets for their products.

The second part of the volume deals with the "tendencies in the marketing of cotton piece goods in the United States" under the headings: Combination and Amalgamation in the Cotton Manufacturing Industry, a wider use of modern marketing technique, the influence of style and colors as factors in marketing, the position of jobber, converter, and retailer in the marketing system, and finally the large domestic and small foreign market for our product.

This is a book which every one connected with the cotton manufacturing industry and with trade in cotton goods should read with care.

CLARENCE F. JONES.

HASSANEIN-BEY, A. M. *The Lost Oases.* xv and 363 pp.; maps, and ills. The Century Co., New York, 1925. 9 x 6¼ in. \$4.00.

DUGMORE, A. RADCLYFFE. *The Vast Sudan.* 312 pp.; maps and ills. Frederick A. Stokes Co., New York, 1925. 8¾ x 5¾ in.

ALEXANDER-POWELL, E. *Beyond the Utmost Purple Rim.* xx and 418 pp.; map and ills. The Century Co., New York, 1925. 8 x 5¼ in. \$3.50.

ALEXANDER-POWELL, E. *The Map that is Half Unrolled.* xv and 355 pp.; map and ills. The Century Co., New York, 1925. 8 x 5¼ in. \$3.50.

A continent emerging from the gray dusk of ignorance; a score of empires in the making; a wealth of resources—agricultural, mineral, forest, power, and labor—in the first stages of development and exploitation; the kaleidoscopic theater of colonial expansion for half a dozen jealous, rival European powers; a table land of deserts, great grasslands, fine forests, snowclad mountain peaks beneath the equatorial sun, great rivers and greater lakes, pestilential marshes and alkali flats, and healthful hill-lands and highlands—these are Africa.

And Africa is still the tramping ground for the hunter, the trail for the adventurer, the stretch of unknown country for the explorer. Some of its mysteries are still hidden; some of its ways are

still untrod; some of its lands are still unmapped. It tantalizes, challenges, flaunts its tropic charms. It is this half-wild, alluring, romantic Africa that these four books describe.

The books are popular. They are written for the public. They are a little given to emphasis of the spectacular, to stress of the sensational, to undue attention to the superficial; but they contain so much of value and are so easy and interesting to read, that they merit any one's attention and time spent over them. They fill in with human interest the geographers' framework of fact.

The Lost Oases, a charming book of the desert by a man of the desert, is the first account of the complete crossing of the Libyan desert from north to south and of the rediscovery of two long-lost oases far east of Egypt. It is a golden record of golden sunshine on the desert—a record not without its tales of hardship and hazard—replete with description of the land, the weather, the way, the nomad peoples that win their living from the arid lands.

It is a book of surpassing interest, one of the best travel books that has recently appeared. It is well written. The illustrations are excellent, appropriate, and richly informative. The book is good!

The Vast Sudan deals with the African Empire southeast of the "lost oases", with that British province that has cost so much good British blood, so much international envy and suspicion and wrangling, and that has excited so much interest in its potential possibilities as a great agricultural country.

The Anglo-Egyptian Sudan is about the same area as European Russia; about 25 times the size of England. Omdurman and Khartoum, north and east of its center, at the juncture of the White Nile and the Blue Nile, constitute the center of its activities and its administration.

The book is a thrilling account of Mr. Dugmore's adventures, a fascinating description of the land through which he traveled, in his inimitable fluent style, and the pictures are evidence of his skill as a photographer. He is not a geographer, but his keen, eclectic observations indicate a geographic bent; it is because of this that his book has more geographic value than have so many popular books of travel.

E. Alexander-Powell's two books, *Beyond the Utmost Purple Rim*, and *The Map that is Half Unrolled*, an African twain that reflect much credit upon the veteran traveler and author who has written them, are wonderfully well told, well illustrated, and well bound. They contain a great fund of valuable geographic information, authentic and accurate, of several African lands about which much has been written and only the half has been told. They will grace any library to which they may be added, and enhance its value.

Beyond the Utmost Purple Rim is a splendid description of Abyssinia, and of Madagascar, with passing references to Somaliland, Kenya, Zanzibar, and the Comoro Islands.

In the author's own words "Abyssinia is a country where, if the stars be right and if your luck hold good, anything may happen. Events breed in the stones of her ancient castles and lie in wait for you down the dark defiles of her mighty mountains. Nor is it surprising that this should be so. It is a heritage which has come down through the centuries along with the traditions of Candace and Balkis and Prester John. About no quarter of the habitable globe has there been such prolonged ignorance and misconception. It seems that there has always been something in the land which prevented a truthful estimate being formed of it. To the old classic writers it was the country of monsters and terrors, inhabited by women with two heads and men with long tails, its mountains and deserts the home of basilisks, salamanders, wiverns, griffins, and unicorns. To the learned of the Middle Ages it was a kingdom of fabulous wealth, ruled by a sort of fairy prince whose scepter was made from an enormous emerald, where the mountains were all of pure gold, and the children played at marbles with huge diamonds. Those travelers who have penetrated Abyssinia in modern times have brought back accounts less fanciful but scarcely less startling, of a civilization which found its inspiration in the court of Solomon, and which, though cut off from all contact with the outside world for more than a thousand years, is today in all essential respects identical with that which prevailed in Europe during the Dark Ages.

"Abyssinia—or the Empire of Ethiopia, to give it its proper name—occupies a great triangular-shaped block of territory in eastern Africa, amid those little-known ranges where the Blue Nile has its source and which the ancients called the Mountains of the Moon. In area it is larger than our three Pacific Coast States combined, with double their population, yet it has no outlet to the salt water (the predatory European nations have seen to that!), being cut off from the Red Sea by the narrow strip of Italian Eritrea and from the Indian Ocean by French, British, and Italian Somaliland. Though bordered on all sides by fever-haunted jungles, the major portion of the country is a vast plateau, or rather a series of plateaus—it has been fittingly called the African Switzerland—which rise abruptly from the surrounding lowlands to a mean height of nearly eight thousand feet. Nearly twice as high, however, are the peaks of the ranges which rear themselves, in turn, from the rim of the great tableland, encircling the country by a tremendous rampart of rock, close on three miles high and penetrable only by deep and narrow clefts through which descend mountain torrents to lose themselves in the sands and swamps of the lowlands. Abyssinia might be described, indeed, as a great walled garden set down in a wilderness, for I do not believe that a finer climate, more beautiful and varied scenery, and greater fertility of soil can be found anywhere in the world outside of California, to which, in many respects, it bears

a striking resemblance. Its mountains are believed to be rich in gold and other minerals, though these resources remain undeveloped owing to the natives' suspicion of foreigners; in the south are large forests of valuable timber trees; unlimited water is almost everywhere available for power and irrigation; seed planted in the amazingly fertile soil of the valleys yields from twentyfold to thirtyfold. Abyssinia is, in truth, the last great prize which the world offers to the daring and the adventurous; for the pioneer and the frontiersman it is the last call."

And of Madagascar, two paragraphs serve to illustrate the author's geographic treatment: "Madagascar is rich in rivers, though most of them are impeded by numerous rocky bars which often form magnificent waterfalls, navigation being possible only on the Betziboka, a stream about the size of the Hudson, which empties into the Mozambique Channel at Majunga and can be ascended by small steamers for about a hundred miles. The eastern rivers cut their way through the rocky ramparts of the plateau by magnificent gorges, their headlong progress down the steep, densely forested slopes to the sea constantly curbed by cataracts and rapids, the Matitanana descending some four hundred feet at a single plunge. Save in the extreme south and southwest, there are no arid regions in the island, the general surface of the table-land consisting of rolling, grassy moors, with numerous outcroppings of bright red clay, and many lovely valleys, which, being the dried-out beds of former lakes, have a soil of bluish-black alluvium.

"Although six-sevenths of Madagascar are within the tropics, the climate of the high interior is that of the temperate zones, for there is no intense heat and during the nights of the cool season the mercury frequently drops to freezing. But the lowlands along the coast are very hot and, especially on the eastern side, extremely humid, while, owing to the numerous marshes and lagoons, fever is common and frequently fatal, not only to Europeans but to unacclimated natives from the interior."

The Map that is Half Unrolled is an account of the author's traverse across equatorial Africa from Dar-es-Salaam on the East Coast, across Tanganyika to Kabalo in east central Belgian Congo, thence northeastward to Stanleyville, and down the Congo to Banana on the west coast, a journey which hardly less than a decade ago would have been impossible, except with a fully-equipped explorer's impedimenta.

The author confesses himself a confirmed traveler. That he has learned the charm of the trail let his own words show: "But, though every traveler speaks of the dangers, difficulties, and discomforts which he has experienced, and sometimes, it must be confessed, lays undue emphasis upon them—probably because every man likes to appear as something of hero to the folks at home—it is not the disagreeable incidents which stick

in the memory, when all is said and done, but the pleasant ones. We forget the stifling heat of the jungle in recalling the blessed coolness of nights on breezes swept uplands. The memory of the long and weary treks across scorching sands or through steaming bush, pales before the recollection of the evenings spent around the leaping camp-fire, with the great black forest lying hushed behind us and the great black river swirling at our feet. We dream of riding with a loose rein across rolling, grassy plains with purple mountains rising in the distance and the sky like an inverted bright blue bowl; of carefree days on lazy, palm-fringed rivers, with the voices of the paddlers raised in some barbaric chorus as the dugout sweeps along; of the joys of loitering about distant seaports, mingling with strange peoples, listening to strange tales, whiffing curious spicy smells."

More narrative, more dramatic than *Beyond the Utmost Purple Rim*, the *Map That is Half Unrolled*, not so essentially geographic, not quite so substantial in its treatment, is none the less a well-painted picture of equatorial Africa today in its transition from wilderness to farm and plantation, from barbarism to civilization, from primitive mystery and simplicity to tropic brazenness and industrial complexity. It treats more of the life of the people than of the background of their environment; more of their social customs and habits than of their industries; more of the political administration than of the resources.

These four books are valuable in many ways. They are interesting to student, teacher, and layman. They are accurate, authentic, first hand. They are valuable additions to our contemporary literature on Africa.

For Africa will soon be different. As Alexander-Powell writes: "Africa, as some of us have known her, is changing rapidly. Civilization is striding across the continent in seven-league boots. No longer do

Geographers, in Afric maps,
With savage pictures fill their gaps,
And o'er uninhabitable downs
Place elephants for want of towns.

"Within the memory of most of us the hinterland of Africa held deserts that were uncrossed, forests unexplored, tribes undiscovered, rivers unnamed. But today every desert has been traversed, not only by caravan but by motorcar and airplane. Today we have surveyed the forests and estimated the number of board feet they contain. We have traced the courses of the rivers and named them and set them down upon our maps. We are familiar with nearly every African tribe, its habitat, language, and customs. And, barring Abyssinia, nearly every foot of territory on the continent has passed under the control of some European nation as colony, protectorate, or mandate."

The map that is half unrolled will soon be spread out before the world!

W. ELMER EKBLAW.

Bureau of Agriculture, Philippine Islands. *Twenty-fourth Annual Report of the Bureau of Agriculture*. 284 pp., 25 statistical tables, 29 plates. Manila Bureau of Printing, Manila, P. I., 1925. 7 x 10 inches.

SMITH WARREN D. *Geology and Mineral Resources of the Philippine Islands*. 559 pp., 23 text figures and tables, 39 plates. Manila Bureau of Printing, Manila P. I., 1924. 6 x 9 1/2 inches. \$2.50.

Bureau of Forestry, Philippine Islands. *Annual Report of the Director of the Philippine Islands*. 216 pp., 18 tables, 2 plates. Manila Bureau of Printing, Manila, P. I., 1925. 6 x 9 inches.

Bureau of Commerce and Industry, Philippine Islands. *Statistical Bulletin of the Philippine Islands for 1924*. 148 pp., 135 statistical tables, 24 graphs. Manila Bureau of Printing, Manila, P. I., 1925. 6 x 9 inches.

Bureau of Commerce and Industry, Philippine Islands. *Commercial Handbook of the Philippine Islands for 1924*. 204 pp., 26 graphs, 93 illustrations, 4 maps. Manila Bureau of Printing, Manila, P. I. 6 x 9 inches. \$2.35.

The economic possibilities of the Philippine Islands are little known to the outside world and insufficiently appreciated by the majority of Philipinos themselves. These resources consist of those of the soil, of the forest, of the sea, and of the mine, their relative value probably being in the order named. All of them are practically virgin resources. Millions of acres of soil are yet untouched, forest after forest has yet to hear the sound of the commercial lumberman's saw, tons of fishery products await modern methods of transportation and preservation, and mineral resources lie idle.

The various departments of the Philippine Insular government are doing a very commendable work in surveying these resources and publishing the results to the Filipino public and to the world in general. These Departments have written or published the books listed above and briefly reviewed below. With these five publications at hand, the teacher or student needs little else to obtain any desired information upon the economic possibilities of the Islands. They should, however, be supplemented by a study of Philippine climate as treated by Coronas in the "Philippine Census of 1918," Vol. 1, Manila Bureau of Printing.

1. *Twenty-fourth Annual Report of the Bureau of Agriculture*.

This report was prepared under the direction of S. Youngberg, Acting Director of the Bureau of Agriculture of the Philippine Islands. It is the twenty-fourth annual report to be issued, the first one coming out in 1901.

The first twenty-three pages are given over to a general discussion of the principal crops and livestock of the Islands, with short general tables

showing comparative production statistics for several years. Picture graphs, reminding one of grade-school geography grades, are used and are open to the old criticism of trying to represent a three dimension object by a two dimension picture. Statistical graphs would be more accurate, scholarly, and appropriate in a government publication.

After seven pages showing the administration of the Bureau of Agriculture, seventy-five pages describe experiments being conducted at various government experiment stations. These include experiments on most of the agricultural products of the Islands and are of much interest to the specialist in agriculture and to the botanist.

Twenty-five pages are given over to a description of the activities of the Extension Division, which include the organization of local producers' associations, horticultural campaigns, demonstration stations, nurseries, campaigns for the growing of rice, sugar, tobacco, and vegetables, and production of more milk and poultry, and the distribution of seeds and plants.

Fifty-one pages report the activities of the Bureau in fighting plant pests, a work most important to the Island's agriculture. All too often a tropical country waits too long to study and combat plant diseases and enemies, as did Ceylon in the case of coffee.

The importance attached to the domestic animals of the Islands is shown in the forty pages describing the administration of government stock farms, various experiments under way, and veterinary activities.

The remainder of the book deals briefly with rural credits, fibers of the Islands, and government publications. Under the latter heading is a bibliography of recent articles on subjects of agricultural interest to the Philipppines.

The Appendix constitutes a very valuable part of the book for one who needs statistical material on the Islands' crops and stock. There are twenty-five giving comparative figures for the crops and stock for 1923 and 1924.

2. *Geology and Mineral Resources of the Philipppines*.

Warren D. Smith has included in this volume, all of the information concerning the geology and mineralogy which is known concerning the archipelago. One finishes the volume, somewhat disappointed in the lack of detailed information concerning physiography, geology, and mineralogy of the Islands. However, this is not Dr. Smith's fault for he has had to draw from reconnaissance reports for a good share of the material. Perhaps the most outstanding fact is that so much information is available after only twenty-six years of work, little being done in the first five years of our occupation.

The book opens by reviewing the work done on Philippine geology and minerals by such men as Von Drasche, Martin, Koto, and Casariego.

This is followed by an outline of the work undertaken in the volume, and a brief résumé of the general geological conditions of the Islands.

The next section is devoted to a rather elementary discussion of what the author is pleased to call "Geography of the Islands." It is a discussion of location, history of exploration, climate, population, flora, and fauna. The treatment is about what one would expect from the pen of a technical geologist. The geographer will be disappointed in what he finds under the heading.

The author does a better piece of work in his next section on physiography, but the reader feels the need of a good physiographic map of the Islands. Such a map is not available. Dr. Smith, like some other geologists, tries to climb aboard the geography band wagon in this section by jumbling together a number of paragraphs which he calls, "human responses to physiographic conditions."

The next two sections of the book, one on stratigraphy and the other on petrography, give the detailed information, as far as it is available, which the geologist would want. The author shows himself at home in this field.

The geologic history of the Islands is next briefly treated after which follows good accounts of the regional geology of the Philippines. The reviewer considers this one of the most valuable parts of the book although the frequent recourse to reconnaissance material shows the need of more geological work in the Islands.

Next follows an interesting and valuable description of vulcanism, earthquakes, and paleontology. The latter subject seems to be cut of its proper place in the organization of the book.

Following this section is a very useful section devoted to a review and summary of the mineral resources of the Islands under the heading of Economic Geology. The author has presented a comprehensive and impartial treatment of the mineral situation and shows that there need be little expectation of great mineral wealth in the Philippines.

The closing pages concern such subjects as the history of Philippine mining, mining laws, etc.

Dr. Smith has made available to the reader all of the information of consequence concerning the geology and minerals of the Islands, material which before, would be found in scores of separate articles. In such compilation lies his contribution.

3. *Annual Report of the Director of Forestry of the Philippine Islands.*

The forest resources of the Philippines are second only to the agricultural products. The annual report of the Director of Forestry is our best source of information on the organization of the Philippine Bureau of Forestry and its work, and the status of the forests and lumber industry of the Islands.

At the time of the taking over of the Philippines

by the United States, our conservation movement was getting well under way. The Philippine government inherited it. Fortunately, 99 per cent of the Philippine forests are government owned, so the movement had full opportunity to develop; as a result the forests will be a lasting heritage to the Philipinos.

The first part of the report describes the organization which handles the eight different districts into which the Islands are divided. Changes and developments during the year in each district are discussed.

Fifteen pages are given over to a discussion of the Division of Investigation and its work. This work consists of various experiments in reforestation and other matters pertaining to the forest welfare of the Islands. The work at Baguio is especially stressed.

The School of Forestry in Laguna province is next described. This school grants degrees in forestry and has an enrolment of about fifty students. The Divisions of Sawmills and Utilization describe how the lumber is graded and scaled, offers tables showing costs and revenues from the various forest districts, and shows the distribution of lumber to domestic and foreign markets. The utilization section discusses the properties and uses of Philippine forest products.

One of the most interesting sections is the Division of Forest Lands and Maps. This division offers a very valuable table and graph of land utilization for the Islands. The lands have been divided as follows:

Commercial forests,	54.4%
Non-commercial forests,	9.1%
Mangrove swamps,	.9%
Unexplored,	4.3%
Cultivated land,	12.5%
Cogon and open lands,	18.8%

This table is exceedingly interesting and valuable to the student of land utilization.

The next sections of the report describe the machinery of the division which issues licenses and the organization of the Bureau as a whole.

Eighteen tables in the Appendix give an abundance of information on the production of Philippine forests, distribution of the product, and other figures of value to the student making a study of the forest products of the Islands.

4. *Statistical Bulletin of the Philippine Islands for 1924.*

Each year the Bureau of Commerce and Industry of the Philippines issues a bulletin bringing the statistics concerning the Islands up to date. This bulletin contains statistical information upon the following subjects:

1. Area and Population.
2. Education.
3. Vital Statistics.
4. Agriculture and Public Lands.
5. Livestock.

6. Forests.
7. Fishing.
8. Mining.
9. Labor and Wages.
10. Manufacturing Industries.
11. Foreign Commerce.
12. Domestic Commerce.
13. Corporations and Associations.
14. Price, etc.
15. Transportation and Communication.
16. Foreign Shipping.
17. Domestic Shipping.
18. Finance, Banking, and Insurance.
19. Meteorological Statistics.
20. Miscellaneous.

This list shows the value of the bulletin to any one interested in the Philippines. The publication would be still more helpful if it gave more information by Provinces.

5. *Commercial Handbook of the Philippine Islands, 1924.*

This book is issued yearly by the Bureau of Commerce and Industry of the Philippines. While its information is authentic it is not exhaustive and is intended more for the business man and the popular reader.

The content of the book deals with the subjects listed in the statistical bulletin described above. Well written description of these subjects, illustrated with maps, graphs, and pictures make the book interesting to the reader.

Departments of geography should have these five publications at hand for Philippine study. They are all authentic and contain much original material. They should, however, be supplemented by the Philippine Census Publications of 1903 and 1918.

C. E. COOPER.

OUR CONTEMPORARIES

GEOGRAPHICAL REVIEW

Vol. XVI, No. 1. January, 1926

The Frontiers of Settlement in Australia. 25 pages. Griffith Taylor. In the last year or two very few better geographic articles than this have appeared in print. Every geographer should read it.

Oceanic and Climatic Phenomena Along the West Coast of South America during 1925. 29 pages. Robert Cushman Murphy. A fine geographic article by a confirmed ornithologist who has keen eyes, a sharp wit, and a fluent pen.

An Ice Cave in Mexico. 5 pages. Willis T. Lee.

Quelpart Island and Its People. 13 pages. R. Burnett Hall. A good bit of economic geography, very well done.

The Birthplace of Civilization. 9 pages. O. G. S. Crawford. An interesting anthropogeographic conjecture.

Railroad Progress in Columbia. 16 pages. Raye R. Platt. A worth-while summary and discussion.

Ice Cap and Sea Ice in North Greenland. 10 pages. Laue Koch. Significant though remote.

The First Steam Voyage to India. 9 pages. Halford L. Hoskins. Historical and valuable.

The Distribution of the Date Palm. 5 pages. Paul Popenoe. A fine article from the borderland between botany and geography that links both in a most interesting way.

The Analysis of Land Forms: Weather Penck on the Nature of Topographic Changes. 11 pages. Isaiah Bowman. A thoroughly treated subject, fundamental to geographers; skilled workmanship by a trained thinker. American Geographical Society. 2 pages.

Geographical Record.

Geographical Reviews.

THE BULLETIN OF THE GEOGRAPHICAL SOCIETY OF PHILADELPHIA

Vol. XXIV, No. 1. January, 1926

A Naturalist's Journey in Borneo to the Volcano of Kinabalu. 18 pages. Greville Haslam. An interesting narrative with much descriptive and factual material worth reading for.

The Politico-Geographical Types of European States. 10 pages. Michael Haltenberger. A valuable discussion of Europe's divisions, and a pigeon-hole classification that will aid the teacher.

Changes in the Habits of the Hopi Indians, Arizona. 8 pages. John W. Harshberger. A brief but most suggestive anthropogeographic bit of information—a people in transition.

Book Reviews.

Geographic News and Notes.

Activities of the Society.

THE JOURNAL OF GEOGRAPHY

Vol. XXV, No. 1. January, 1926

Suggestions on a Course of Study for Third or Fourth Grade Geography. 7 pages. Alison E. Aitchison and Marguerite Uttley.

Geographic Influences in Development of Porto Rico. 13 pages. Florence Whitbeck. A fragment of Economic Geography, somewhat trite and a little pedantic, but worth the teacher's study.

The Relation of Agriculture to Mining in the Upper Peninsula of Michigan. 9 pages. J. Russell Whitaker. A nice study in geographic inter-relationships.

The "Other Gaps" and the Port of New York. 5 pages. Stephen G. Rich. A brief, emphatic reminder that "not all eggs should be carried in one basket"; that the "Other Gaps" have their significance.

Washington—The Nation's Capital. 2 pages. Louise W. Mears.

Geographical Publications.

Vol. XXV, No. 2. February, 1926

The Coast Waters and Coast Lands of Peru. 11 pages. R. H. Whitbeck. An excellent addition to our geographic literature on South America.

The Objective Measurement of Problem Geography. 8 pages. Mendel E. Branom.

A Mid-Western Tornado. 7 pages. Marjorie Mae Shank.

Geography in the Schools of Finland. 5 pages. Karl Kekoni.

Geography as a Core Subject for the Curriculum. 4 pages. Mayme Pratt Renner. Worth close reading by every geographer, every teacher.

Let's Get Acquainted. 1 page. Elise Soulier.

Annual Meeting of the National Council of Geography Teachers. 2 pages.

Geographical Publications.

THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XLIX, No. 1. January, 1926

On the Trail of the Air Mail. 62 pages. Lieutenant J. Parker Van Zandt. A bird's-eye view across America.

Man's Feathered Friends of Longest Standing. 47 pages. Elisha Hanson. An interesting article, with some geographic value.

Pigeons of Resplendent Plumage. 12 Paintings. Hashime Murayama.

Measuring the Sun's Heat and Forecasting the Weather. 15 pages. C. G. Abbot. An authoritative statement of the progress being made in this interesting, and possibly most significant, field of research.

Vol. XLIX, No. 2. February, 1926

Round About Bogota. 33 pages. Wilson Popence. Every economic geographer should read this illuminating article rich in factual content.

Fishing for Pearls in the Indian Ocean. 23 pages. Bella Sidney Woolf. An economic study, picturesquely treated.

Rothenburg, the City Time Forgot. 13 pages. Charles W. Beck, Jr.

The Road to Wang Ye Fu. 37 pages. Frederick R. Wulsin. Many good pictures, but little text, of value to the geographer.

Scenes in the Celestial Republic. 16 Illustrations.

THE JOURNAL OF LAND AND PUBLIC UTILITY ECONOMICS

Vol. II, No. 1. January, 1926

Some Aspects of the Valuation of Private Property for Public Uses. 16 pages. William L. Ransom.

- The Planning and Control of Outlying Shopping Centers.** 6 pages. J. C. Nichols.
- The Wheat Farmer of Southeastern Washington.** 7 pages. William E. Leonard. Of more than casual interest to the Geographer.
- Influence of Business Cycles of Utility Operations.** 8 pages. A. E. Patton and O. Gressens.
- Bank Failures in Iowa.** 19 pages. Fred L. Garlock.
- The Collective Leasing and Farming of Land in Italy.** 6 pages. Asher Hobson.
- Cost of Money to Public Utilities, 1914-1922.** 20 pages. Frank Parker.
- Our Indian Land Policy.** 16 pages. Flora Warren Seymour.
- Motor Transport and Our Radial Frontier.** 10 pages. John C. Long.
- Department Contents.**
- Book Reviews.**
- Summaries of Research.**
- Comments on Legislation and Court Decisions.**

WORLD AGRICULTURE

Vol. VI, No. 1. Spring, 1926

International Organization Number

- Needed Readjustments in Rural Life Today.** 2½ pages. A. C. L. A. Conference, Richmond, Va.
- International Organization of Agricultural Associations.** 1 page. Proposals from Poland, Germany, Italy and France.
- International Conference of Agricultural Associations.** 2 pages. Answers to the Berne Conference questionnaire sent out by Dr. Laur, and Discussion of these answers by the Editor.
- An International Federation of Agriculture.** 2 pages. Dr. W. A. Riddell.
- The Permanent Commission of Agricultural Associations at the Institute in Rome.** 1 page. Announcement from the Institute.

Departments:

- Among Our Members**—F. H. Allen; Rudolf A. Clemen; Tage U. H. Ellinger; A. W. Gilbert.
- Agricultural Missions**—Teacher-Training in Many Lands; Recruiting for Rural Service; Adjustment of Training and Environment for Women; Annual Banquet of the I. A. A. M.
- The Home Garden**—A Visit to Henry Correvon's Alpine Garden near Geneva; Reviews of Garden Books.

NEWS ITEMS

UNIVERSITY OF NEBRASKA

DEPARTMENT OF GEOGRAPHY

Mr. Walter C. Hansen, graduate assistant in the department, will receive his Master's degree at the June commencement. Mr. Hansen will teach during the summer term at the Michigan State Teachers' College, Ypsilanti, Michigan.

Mr. George E. Harding, receives his Master's degree in June and will be in charge of the geography work at the University of Indiana at Bloomington, Indiana, during the summer session.

Mr. John R. Muhm, who received his Master's degree in geography in the summer of 1925, has been appointed to teach in the Kansas State Teachers' College at Emporia, Kansas, during the summer of 1926.

Mr. Leland S. Paine, Bachelor of Science from Nebraska, will receive his Master's degree at the University of Wisconsin in June, and will teach geography at the Illinois State Normal University at Normal, Illinois, during the summer session.

Mr. Raus M. Hanson will receive his Master's degree in geography at the University of Nebraska in June. Mr. Hanson has been elected to teach geography in the summer session at the Iowa State Teachers' College at Cedar Falls, Iowa.

Miss Ruth McDill, M.A. in geography, University of Nebraska, June 1925, will return to Normal, Illinois, to teach geography in the first summer term at the Illinois State Normal University. Miss McDill is teaching geography in the University of Oklahoma at Norman.

Prof. N. A. Bengston of the Geography Department will teach geography during both summer terms at the University of Nebraska, offering the following courses: First term: Introduction to Economic Geography, Regional Geography of North America, Geography of Latin America and Research; second term: Geography of the Land, Economic Geography of the United States, Geography of Europe, and Research.

Prof. E. E. Lackey of the Geography Department will teach geography during the first term at the University of Nebraska. Courses which he will offer are in General Geography, Geography of Nebraska, and Geography for Teachers in the Elementary Schools.

Miss Esther S. Anderson of the Geography Department will teach geography in the second summer session at the University of Nebraska. She will teach courses in General Geography, Geography of Nebraska, and Geography of the United States.

Mr. A. B. Clayburn, who received his Master's degree at Nebraska during the summer of 1925, is teaching geography in the Nebraska State Teachers' College at Peru, Nebraska. He plans to start work for his Doctorate degree at Chicago during the summer of 1926.

Nebraskans who attended the annual meetings of the National Council of Geography Teachers and the Association of American Geographers at Madison, Wisconsin, were Prof. E. E. Lackey, Mr. Raus M. Hanson, Mr. Walter C. Hansen, Mr. George E. Harding, and Miss Phyllis Rice from the University of Nebraska. Mr. A. B. Clayburn from the Nebraska State Teachers' College at Peru, Nebraska, and Mr. E. E. Melvin, professor of geography at the Nebraska State Teachers' College at Wayne, and Mr. Leland S. Paine, now at the University of Wisconsin. Mr. Raus M. Hanson presented a paper, "Geographic Factors in the Railroad Revenues of Nebraska," at the meeting of the Association of American Geographers. Prof. E. E. Lackey gave a paper entitled "The Selection of Geographic Materials for the Junior High School" at the meeting of the National Council of Geography Teachers. This article will soon be published in the *Journal of Geography*.

"The Pupil's Workbook in the Geography of Nebraska," by Prof. N. A. Bengston, has recently been published. It is being adopted in many schools in Nebraska.

Miss Phyllis Rice of the Geography Department will have charge of the geography instruction at the Nebraska State Teachers' College at Peru, June 6 to August 20.

THE OHIO STATE UNIVERSITY

DEPARTMENT OF GEOGRAPHY

Enrollment in the different courses for the winter quarter has reached a total of 603, bringing the total for the year so far up to 1,400.

The following courses will be given during the summer quarter: The Historical Geography and Commerce of the United States, by Prof. C. C.

Huntington; *The Geography and History of Commerce*, by Prof. R. Peattie. Courses in *Principles of Geography* and *Economic Geography* will be given also.

Prof. Eugene VanClef will spend the summer in the Baltic region to complete economic field studies begun in Finland in 1923 and to visit the principal ports of the new Baltic countries.

An article, "What is Social Geography?" by C. C. Huntington, appeared in the March number of the *Journal of Geography*.

Mr. Harold Fischer will receive the Master's degree in June. The subject of his thesis is, "Some Aspects of the Geography of Pennsylvania."

UNIVERSITY OF MICHIGAN

DEPARTMENT OF GEOGRAPHY

The following courses are offered in the summer session: *The Elements of Geography*, and the *Regional Geography of South America*, by Asst. Prof. James; the *Geography of Commercial Production*, and the *Geography of Central America and the West Indian Islands*, by Mr. R. B. Hall. Special work in field studies of the local area will be open to advanced students. Prof. K. C. McMurry will be in charge of the geography summer camp in Kentucky.

Following the summer session Mr. Hall will make a second trip to Haiti to complete the field work for his Doctor's thesis. Asst. Prof. James will accompany him. They will visit several other islands of the West Indies in addition.

Prof. K. C. McMurry will continue his field studies in Menominee County, Michigan during the latter part of the summer. He is working in cooperation with the Michigan Land Economic Survey.

Mr. S. D. Dodge will attend the summer quarter at Chicago to complete his work for the Doctor's degree. His dissertation deals with the geography of the area around Princeton, Illinois.

Mr. F. A. Stilgenbauer is continuing his study of Prince Edward Island which will lead eventually to his Doctor's dissertation.

Mr. C. M. Davis, E. C. Prophet and A. T. Naverre will complete work for the Master's degree this June. Their thesis topics deal with the study of local areas.

COLUMBIA UNIVERSITY

DEPARTMENT OF GEOGRAPHY

Columbia University has recently taken an important step in correlating the advanced work in geographic lines given in that institution. Because geography, dealing with the influence of physical environment upon life, necessarily

involves at least two fields of learning—physiography and one other such as economics, history, botany, zoölogy—the administration of the higher degrees is placed under the control of the Joint Committee on Instruction instead of in the hands of any one school or department of the university. The Joint Committee operates through a Committee on Advanced Degrees in Geography, consisting of the Dean of the Faculties of Political Science, Philosophy, and Pure Science as chairman, a professor of physiography, and a professor of economic geography, with such additional representatives from other departments of the university as the chairman may deem fit to add from time to time. For the current year this committee consists of Dean George B. Pegram (in the absence of Dean F. J. E. Woodbridge on leave), Prof. Douglas Johnson, and Asst. Prof. J. E. Orchard. There has recently been issued a special circular of information on geography at Columbia University, in which more than forty geographical courses are listed, in addition to other courses of interest to geographical students.

During the year graduate students at Columbia University have been carrying on physiographic researches in several directions. Miss E. I. Winter has completed a Master's essay on local variations of mean sea level and their causes, and Mr. W. D. Burden on the evolution of sections of the Long Island coast, including Gardiners Island. Several students have Masters' or Doctors' theses in preparation: Miss O. Kuthy, an analysis of the data on elevated shorelines in different parts of the world, with a view to determining the validity of these records as evidence of sea level changes as opposed to changes of land level; Mr. H. S. Sharp, a study of artificial beaches along portions of the Atlantic coast; Miss E. H. Varady, the influence of topography on the Gettysburg campaign; and Mr. D. A. Nichols, the physiographic evolution of the southern coast of New Jersey.

Prof. C. P. Berkey, who returned late in the fall from his second season in Mongolia with the Third Asiatic Expedition of the American Museum of Natural History, has delivered a number of lectures on the geology and physiography of the region, including the Darwin lecture at New York University. Recently he made a trip to the middle western states, where he addressed several audiences: A popular lecture was delivered before the Geographic Society of Chicago on "The Exploratory Results in Central Asia." At Northwestern University, and the Universities of Wisconsin, Minnesota, and Kansas, as well as the Missouri School of Mines, lectures were given before general audiences and before the local chapters of Sigma Xi on "A Geologist's Story of

Explorations in the Gobi Desert," "The Scientific Results of the Third Asiatic Expedition," and "The Geologic Problems of the Catskill Aqueduct."

In October Mr. D. A. Nichols, a member of the Geological Survey of Canada and a graduate student at Columbia University, lectured before the New York Academy of Sciences on the physiography of Canada.

Prof. Douglas Johnson gave an outline of the subsidence of the Goose Creek area, Texas, at the annual meeting of the Geological Society of America held in New Haven the latter part of December, and later spoke on the same subject before the Journal Club of the Department of Geology of Columbia University. The Goose Creek oil field, bordering the shore of Galveston Bay, has within eight years suffered a subsidence amounting to approximately three feet at the maximum. Important legal problems were involved, since if the submergence were due to natural causes the owners of the land and the companies operating the oil field would lose all rights, naturally submerged land belonging by law to the state. If, however, the submergence were due to artificial causes, the owners and operators could continue to enjoy the wealth produced by this rich field. Investigation proved that the subsidence was due directly to the withdrawal of large amounts of oil, gas, and sand from the unconsolidated Coastal Plain strata.

In October Professor Johnson addressed the officers of the U. S. Army War College at Washington on "The Military Geography of the

Northeastern United States." In December he delivered the annual initiation address before the Colgate University chapter of Phi Beta Kappa, on the physiographic evolution of the Grand Canyon district. On January 21 he lectured on the Goldwin-Smith foundation at Cornell University, taking as his subject the shoreline scenery of the Atlantic Coast and its significance. April 9 he will deliver the invitation address at the annual meeting of the Ohio Academy of Science at Columbus, Ohio, and April 14 the annual oration before the Denison University chapter of Phi Beta Kappa. His subject in each case will be the evolution of the Grand Canyon region.

CLARK UNIVERSITY

DEPARTMENT OF GEOGRAPHY

The New England Geographical Conference will be held at Clark University, May 7 and 8. On the program will be a field excursion conducted by Dr. Wallace W. Atwood.

The annual meeting of the Association of Clark Geographers will be held on the evening of May 8.

Arrangements have been made for three field trips following the Summer School. Each trip will be made by motor but with accommodations for twenty-two persons. All trips begin Saturday, August 14, at 8 A.M., and continue for two weeks, returning to Worcester on Friday evening, August 27. Trip 1, will cover the New England states; Trip 2, the Berkshire-Hudson valley; Trip 3, the Champlain lowland, the St. Lawrence lowland, and the port of Montreal.

ANNOUNCEMENT

THE series of articles *Agricultural Regions of the World* will be resumed in the July issue when the first half of *Agricultural Regions of North America*, by Dr. O. E. Baker of the United States bureau of Agricultural Economics will appear, illustrated by an excellent colored map and many maps in black and white, presenting the latest agricultural data available; this superb article will be completed in the October issue, when another up-to-date colored map and the final textual material will conclude one of the best popular, thoroughly scientific, presentations of North American agricultural geography in print.

Agricultural Regions of South America, by Clarence F. Jones; *of Africa*, by Homer L. Shantz; *of Australia*, by Griffith Taylor; and *of Asia*, by Olof Jonasson, will follow in later issues.

All these articles will be illustrated by maps, charts, and pictures. The series will constitute one of the most complete geographic discussions of the world's agriculture thus far published.

To obtain the complete series of these extremely valuable articles, which present for the first time on such a comprehensive and accurate basis, the significant divisions of the world's most important industry, it will be necessary to subscribe at once for ECONOMIC GEOGRAPHY, and date back to the October issue.

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